AFFIDAVIT

The undersigned LEON H. TOUPS, a U. S. Citizen residing at 418 Harbor View, Largo, FL 33770, Florida, declares to have read the U.S. Patent Number 6,113,748 by WILLIAM H RICHARDSON, JR., filed on August 11, 1998 by attorney CHARLES A. MCCLURE and issued on September 5, 2000, under the Primary Examiner KATHRYN GORGOS and Assistant Examiner THAO TRAN, which U.S. Patent discloses in both the description and the claims the new chemical species of "magnecules" as being Richardson's own invention.

OIPE JC25 JAN 28 2004 PATENT & TRADEMARK OFFICE

The undersigned submits that the magnecules are instead the invention of Prof. RUGGERO MARIA SANTILLI, a U.S. Citizen residing at 35246 U.S. Hwy. 19 N., Suite 115, Palm Harbor, Florida 34684.

09/01/2004 00000025 6113748

The undersigned therefore submits the patentee falsely represented in the description that he is the inventor of the "final (or third) fraction" of claim 1, which is further defined as "larger gaseous aggregations" in claims 2 and 5, and more specifically claimed as the "magnecules" in claim 9. In support of this request the undersigned states the following:

1. Prof. Santilli is an internationally known senior U. S. scientist, who achieved the highest education in theoretical physics and applied mathematics, and has been a member of prestigious academic institutions around the world, including a member of Harvard University under research contracts with the U. S. Department of Energy, as more particularly illustrated in a summary of Prof. Santilli's curriculum in Attachment A. By comparison, Mr. Richardson has no record of advanced college education, was a welder for some time, and his last known employment, prior to becoming self-employed, was that of an employee for the company I was President of.

2. The new chemical species of magnecules is extremely advanced in conception, treatment and experimental verification, since it requires in-depth mathematical, theoretical and experimental aspects of particle physics, nuclear physics, molecular physics, superconductivity and other fields. In fact, the new species of magnecules is more properly called

"electromagnecules." A new intense magnetic field is created in any atomic structure under which atoms can bond to each other via opposing polarities resulting in new clusters with large atomic weight which are more simplistically called magnecules. The clusters are detected by well-identified macroscopic peaks in Gas Chromatography Mass Spectrometry (GC-MS) which remain unidentified following a search among all known molecules. Moreover, the peaks possess no InfraRed signature (IR) at their molecular weight, thus confirming the lack of conventional valence bonds as the attractive force responsible for the existence of stable clusters. The primary magnetic origin of the bond is then established by other very technical theoretical and experimental arguments.

3. It is evident that, in view of such a complexity, Mr. Richardson Jr. does not have the background to be the inventor of the magnecules because of the lack of the necessary knowledge in physics, mathematics and superconductivity. On the contrary, in view of his advanced expertise and record (see Attachment A), Prof. Santilli has indeed the basic knowledge in various advanced fields to be the inventor of the magnecules. At any rate, Prof. Santilli is universally known in the scientific community and the published literature to be the discoverer of the magnecules which is commonly referred to as "Santilli Magnecules."

4. The documented evidence that Prof. Santilli is the sole discoverer of the magnecules is the following: On February 15, 1998, the U. S. public company TOUPS TECHNOLOGY LICENSING, in Largo, Florida, of which I was at that time the President and CEO, hired Prof. Santilli as an independent consulting scientist for the specific task of studying the basic physical and chemical properties of electric arcs within liquids. Before this research, and following lifelong studies in particle physics, nuclear physics and molecular physics, Prof. Santilli had predicted the existence of a new chemical species more general than that of molecules, which he called "electromagnecules" in general and "magnecules" in particular, as described in Patent Application Serial Number 09/106,170 entitled "ELECTROMAGNETION",

filed on 06/29/98 and other art PRIOR to the 6,113,748 patent to Richardson. On June 19, 1998, Prof. Santilli visited the laboratories of NATIONAL TECHNICAL SYSTEMS (NTS) located at McClellan Air Force Base in Sacramento, California, for the purpose of conducting GC-MS analyses on gaseous fuels produced by underliquid arcs. These tests provided the first experimental confirmation on the existence of Santilli's magnecules. A letter by Dr. LOUIS A. DEE, Laboratory Director, addressed to Prof. Santilli, and hereby enclosed as Attachment B, confirms the conduct at NTS of said tests and the new character of the results. Numerous additional experimental confirmations were subsequently obtained also by Prof. Santilli at other laboratories, as documented in the specialized technical literature (see below).

5. I hereby affirm that, following his return from the NTS tests, on June 21, 1998, Prof. Santilli made available to my company, of which Mr. Richardson was an employee, all evidence of the analytic results, including copies of all GC-MS and IRD print-outs and statements. Subsequent to the acquisition of said knowledge on or about June 21, 1998, Mr. Richardson applied on August 11, 1998 for said U.S. Patent 6,113,748.

6. In said U.S. Patent No. 6,113,748, it appears Mr. Richardson himself alludes to the fact that he is not the discoverer of the magnecules. In fact, in Column 6, lines 14-20, Richardson states "A world-renowned physicist has personally observed/supervised the last two such analyses and is convinced that the fuel contains as yet unidentified materials, electromagnetically bonded, as distinct from chemical bonding, whereupon it seems reasonable to call slow-diffusing portion(s) of the fuel 'magnecules' - emphasizing their magnetic character". The "world renowned physicist" quoted by Mr. Richardson in his above identified statement must be Prof. Santilli. Mr. Richardson, intentionally it appears, abstained from identifying Prof. Santilli as the "world-renowned physicist" who actually discovered Santilli Magnecules, and further attempted to claim inventorship of the magnecules by claiming in extremely vague

terms that a so-called third or final fraction remains in a semi-permeable membrane (balloon test). In fact claim 1 is simply a balloon that claims that a heavier gas remains longer in the balloon. The meat of the claims is claim 2 and 3 which are necessary steps to create the gas which Richardson claims in claim 8 to be aggregates "however bonded," then finally claims in claim 9 that the aggregates are magnecules, the "however bonded" referring to the magnetically bonded clusters.

What Richardson is trying to claim is a magnecule produced by the steps of claims 2 and 3, and verification that the gas is an aggregate which is heavier than hydrogen by filling a balloon as claimed in claim 1. The process and verification were actually done by Prof. Santilli under contract with Toup Technology, Inc. and the so-called analyses referred to by Richardson in Col. 6 line 15, appears to be the verification testing conducted at the labs at McClellan AFB under the testing and verification supervision of Prof. Santilli.

Mr. Richardson was an employee with Toups Technology, which allowed him access to observe Dr. Santilli's research. He is simply not the true inventor of the claims in the '748 patent and I submit that the true inventor of the claims which attempt to claim inventorship of the magnecule is Dr. Santilli.

7. The scientific evidence on the discovery of the new chemical species of magnecules was published and copyrighted by Prof. Santilli in the scientific publication "Theoretical and experimental evidence of the new chemical species of magnecules", Hadronic Journal, Volume 21, 1998, pages 789-894, Attachment C, which publication is the first on record in the field, thus confirming the paternity of the discovery by Prof. Santilli. It should moreover be noted that a copy of said publication was available for Mr. Richardson as an employee. Further, as an employee of my company, Mr. Richardson signed a Non-Disclosure, Confidentiality and Non-Compete with my company.

8. The academic acknowledgement on the paternity of the new chemical species of magnecules has been the publication by one of the leading scientific publishers world wide, KLUWER

ACADEMIC PUBLISHERS of Amsterdam, The Netherlands, of Prof. Santilli's post Ph.D. monograph entitled "Foundations of Hadronic Chemistry with Applications to New Clean Energies and Fuels" (Attachment D), which monograph is specifically and primarily devoted to a technical presentation of the new chemical species of magnecules.

All of the above documentary evidence establishes that: 1) Prof. Santilli is the discoverer of the new chemical species of magnecules; 2) Prof. Santilli's work was available to Mr. Richardson under my employment.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Affiant

9/26/01
Date

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9/24/01

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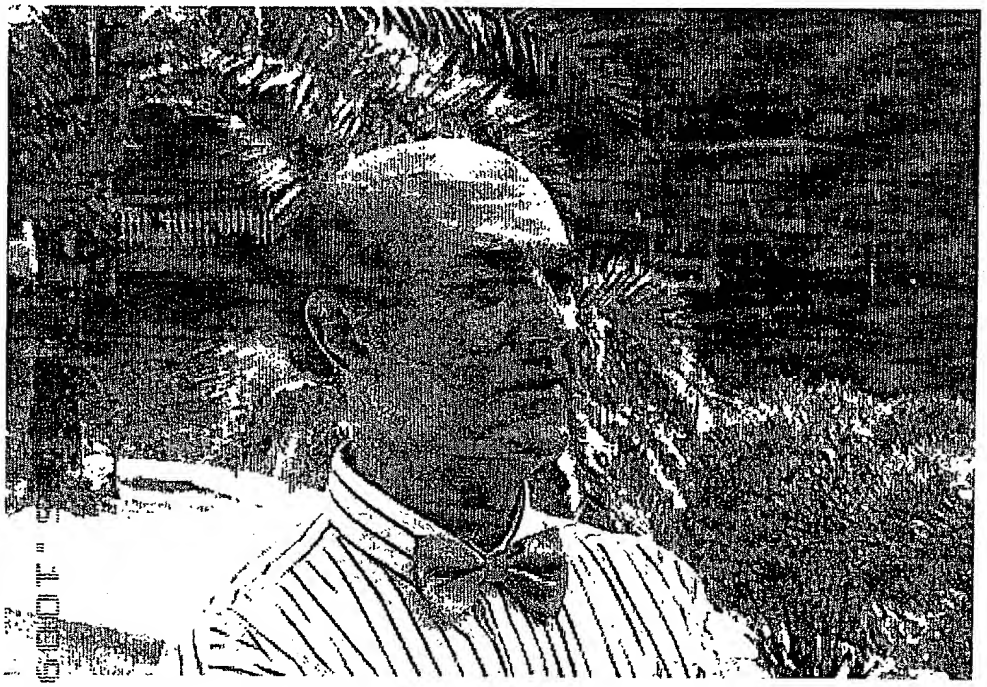
Info@SantilliMagneGas.com

CURRICULUM OF
Dr. Ruggero Maria Santilli



A recent photo of Dr. Santilli

Largo, Florida, November 25, 2000

SUMMARY OF CURRICULUM VITAE OF
Ruggero Maria Santilli

prepared by
EarthFirst Technologies, Inc.
A U. S. Public Company
13100 Belcher Rd
Largo, FL 33773

CAREER

1. Santilli received the degree of 'Dottore in Fisica' (Physics Doctor) from the University of Naples, Italy. He subsequently attended the Graduate Shool in Physics of the University of Turin, Italy, where he obtained in 1966 the highest graduate degree in physics available at that time, corresponding to the U. S. 'Philosophical

Doctor in Physics.' Jointly, Santilli held the chair of 'Professor of Nuclear Physics' at the famous A. Avogadro Institute in Turin, Italy.

2. Because of his post Ph.D. research conducted in Italy, Santilli was invited in 1967 by the University of Miami in Florida to conduct research under NASA financial support. In 1968, Santilli joined the faculty of Boston University as Associate Professor of Physics, where he taught physics and mathematics from prep-courses to post Ph.D. Seminal courses, and conducted research for the U. S. Air Force, research which led to his assuming the U. S. Citizenship.

3. In 1976 and 1977 Santilli was a visiting scholar at the Institute for Theoretical Physics of the Massachusetts Institute of Technology.

4. in 1978 Santilli joined Harvard University where he was co-principal investigator of research grants from the U. S. Department of Energy numbers ER-78-S-02-47420.A000 and AS02-78ER04742.

5. In 1983 Santilli assumed the position of President and Professor of Theoretical Physics of the newly formed Institute for Basic Research, then located on Harvard Grounds, as wel as Principal Investigator of DOE contracts DE-ACO2-80ER10651, DE-ACO2-80ER-10651.A001, and DE-ACO2-80ER10651.A002. The Institute for Basic Research was subsequently moved to Palm Harbor, Florida, in 1990.

6. In 1998-2001 Santilli assumed the additional post of Director of Research of corporations in the U.S.A., Europe and Asia.

7. Recently Santilli retired while remaining affiliated with a number of academic and corporate research institutions around the world, including U.S.A., Ukraine, Russia, China, Italy, and Australia.

8. Santilli is the Founder and Editor in Chief of three journals, Hadronic Journal (which was initiated at Harvard University and continued for 24 years of uninterrupted publications), Hadronic Journal Supplement (with 19 years of uninterrupted publications) and Algebras, Groups and Geometries (with 20 years of uninterrupted publications).

9. Santilli is also Editor of the International Journal of Physycs, the Journal of the Balkan Geometry Society, and otehr Journals. he is also a reviewer or advisor to numerous other journals.

PUBLICATIONS

PAPERS

1. Santilli is the author of over 200 technical articles in pure mathematics, applied mathematics, theoretical and experimental physics, superconductivity, chemistry, biology, astrophysics and cosmology published in virtually all refereed journals around the world, including:

PHYS. REVIEW (relativistic extension of the Galilean symmetry with P. Roman; extension of the PCT theorem to all discrete symmetries with C, N. Ktorides, inapplicability of Pauli's exclusion principle under open-nonconservative strong interactions with H. C. Myung; isotopic breaking of gauge symmetries; and several other papers);

NUOVO CIMENTO, NUOVO CIMENTO LETTERS and RIVISTA NUOVO CIMENTO (first presentation in physics - with application to dissipative systems - of Albert's Lie-admissible algebras; first (p.q)-deformation of Lie algebras - 1967; first prediction that strong interactions can causally accelerate massive particles at speed greater than c; first generalizations of the Minkowski space, Lorentz-Poincare' symmetry and special relativity for arbitrary speeds of light within physical media and interactions; and several other papers published up to 1983, year of take over of the Italian Physical Society by Mr. Ricci and his group and consequential suppression of all - about 100 - submission by Santilli and his associates, all papers published elsewhere);

RENDICONTI CIRCOLO MAT. PALERMO (systematic generalizations - from numbers to spaces, functional analysis, differential calculus, topologies, etc. - of contemporary mathematics of isotopic,

genotopic and hyperstructural type based on generalized units and products - used for the treatment of matter in progressive conditions of complexity - and the anti-isomorphic images of said generalized mathematics called isodual - for the treatment of antimatter; first structural generalization of Newton's equations on record since Newton's time -for which Santilli invented his generalized calculi and topologies - for the representation of extended-deformable particles under unrestricted nonlocal and nonpotential interactions; first structural generalization of Hamiltonian mechanics and related inverse problem which is directly universal for all possible discrete systems of extended-deformable particles; structural liftings of the Euclidean, symplectic and Riemannian geometries for arbitrary causal local speeds, etc.).

INTERN. J. PHYSICS and MODERN PHYS. LETTERS (first and only known "classical" theory of antimatter on scientific record - beginning from Newton's equation - whose operator image is compatible with charge conjugation; first axiomatically consistent prediction of antigravity for antimatter in the field of matter; first structural unification of the Minkowskian and Riemannian geometries permitted by the generalized calculi, with consequential geometric unification of special and general relativities; comprehensive study of the catastrophic inconsistencies of noncanonical-nonunitary theories when treated with conventional mathematics);

FOUND. PHYS. and FOUND. PHYS. LETTERS (first proposal on record - 1981 - that quarks cannot be elementary; achievement of maturity in 1976 with a comprehensive memoir on hadronic mechanics following its proposal in 1978; experimental review with Yu Arestov of deviations from the Minkowskian geometry and special relativity in the interior of hadrons; "invited" paper on the first invariant formulation of (p, q)-deformations and consequential resolution of the catastrophic inconsistencies of their current formulation; first and only known axiomatically consistent grand unifications "with a basic unifying symmetry and geometry" embedding gravity in the unity of electroweak interactions; and other papers);

COMMUN. THEOR. PHYS. (a variety of papers including: first achievement of a rigorous confinement of quarks via the incoherence of internal and external Hilbert spaces solely permitted by hadronic mechanics; first proposal of the isodual theory of antimatter holding at all level of study -rather than only in second quantization as per theories prior to Santilli's works; first proof that Heisenberg's uncertainties remain valid for nonpotential interactions in closed conditions; and several other papers);

MIT-ANNALS OF PHYSICS (comprehensive study with seven papers in the 1970s on the integrability conditions for the existence of a Lagrangian or a Hamiltonian in discrete and field mechanics; and other papers).

JINR - RAPID COMMUN. (first isotopic lifting of the SU(2)-isospin with first recovering of the exact isospin symmetry in nuclear physics; and other results);

ACTA APPL. MATH. (first nonunitary isotopies of the SU(2)-spin, first structural generalization of Pauli's matrices with hidden parameters; first proof that the nonunitary-isotopic image of Bell's inequality does indeed admit a classical counterpart contrary to popular beliefs; and other papers);

IoP-JOURNAL OF PHYSICS (first proof that the experimental data on the anomalous behavior of the meanlife of unstable particles with speed can be exactly represented by the isominkowskian geometry, published with other co-authors; and other results);

HYPERFINE INTERACTIONS ("invited paper" on the first proof that photons emitted by antimatter are different than those emitted by matter, which differences can be experimentally measured; first future possibility of ascertaining whether a far away galaxy is made up of matter or of antimatter' and other basic advances in antimatter);

INTERN. J. QUANTUM CHEMISTRY (first hadronic generalization of superconductivity and its first structural representation of the bonding-attraction of the two identical electrons in the Cooper pair, published with A. O. E. Animalu);

#INTERN. J. HYDROGEN ENERGY (first nonunitary-hadronic generalization of quantum chemistry; first known model of molecular bonds with "attraction" between identical valence electrons; first achievement on record of a representation of molecular data exact to the seventh digit; and other major advances in chemistry,

;published with D. D. Shillady);

J. NEW ENERGY (first exact-numerical representation on scientific records of all nuclear magnetic moments; a new structure model of nuclei explaining why the deuteron has spin 1; comprehensive review of the experimental verifications of hadronic mechanics in particle physics, nuclear physics, molecular physics, superconductivity, biology, astrophysics, and cosmology);

NUMEROUS OTHER JOURNALS AND CONFERENCE PROCEEDINGS with: first axiomatically consistent reduction of macroscopic irreversibility to the ultimate level of nature, particle in interior conditions; first resolution via hadronic mechanics of the historical objection against Rutherford's conception of the neutron as a bound state of a proton and an electron; first proposal o to utilize the the immense clean energy in the structure of the neutron via its stimulated decay; first causal spacetime machine - for isoselfdual states only; numerous proposal of new clean energies at the nuclear level; first cosmology with a universal symmetry which, for equal distribution of matter and antimatter, implies total null characteristics of the universe, with consequential lack of discontinuity at creation, thus permitting the first scientific study of creation itself; proposal and construction of the hadronic reactors capable of tapping energy within liquid molecules; theoretical prediction and vast experimental verification of the only known new -nonvalence - chemical species - called "magnecules"- on scientific record since the discovery of the valence in the 1800s, and its crucial implications for new clean fuels; and numerous other discoveries.

MONOGRAPHS

Santilli is the author of TEN MONOGRAPH, including:

SPRINGER-VERLAG-HEIDELBERG (two seminal monographs "Foundations of Theoretical mechanics:", Vols. I and II, in the most prestigious series of Texts and Monographs in Physics on the integrability conditions for the existence of a Lagrangian or a Hamiltonian, the Birkhoffian generalization of Hamiltonian mechanics; and a comprehensive presentation of the isotopies and genotopies of Lie's theory now called Lie-Santilli iso-, geno- and hyper theories);

UKRAINE ACADEMY OF SCIENCES- KIEV (two volumes of "Elements of Hadronic Mechanics" with the third volume currently in preparation containing a comprehensive study of the new covering mechanics, its various applications and numerous experimental verifications in various fields; "Isotopic, Genotopic and Hyperstructural Methods in Theoretical Physics", which, according to reviewers, is the most innovative monograph in biology to date, the only one representing the irreversibility of biological systems - since all current quantum studies are strictly reversible, thus incompatible with biological reality;

KLUWER ACADEMIC PUBLISHER, Boston-Dordrecht-London (Santilli is the author of the post Ph. D. level monograph 'Foundations of Hadronic Chemistry with Applications to New Clean Energies and Fuels', ISBN number 1-4020-0087-1, in press, which contains a systematic presentation, beginning with the discovery of new mathematics, of a structural generalization of quantum chemistry, the first capable of exact representations of experimental data on molecules, such as binding energies, electric and magnetic moments. The monograph also shows that the abandonment of theories now belonging to the past millennium in favor of new, broader scientific horizons is necessary for the development of really 'new' and 'clean' energies, as well as of really 'new' fuels capable of resolving the catastrophic environmental problems caused by fossil fuels).

HADRONIC PRESS-FLORIDA (two volumes of "Lie-admissible Approach to the Hadronic Structure" with the third in preparation, the first comprehensive proposal of a new structure model of hadrons with physical massive constituents in generalized interior condition which constituents can be produced free in the spontaneous decays, while achieving compatibility with composite quarks; two volumes of "Isotopic Generalization of Galilei's and Einstein's Relativities", the first and only generalizations of existing relativity for nonpotential-nonconservative forces with a basic symmetries - since all deformations have no symmetry whatever; "Foundations of Hadronic Chemistry and its Application to New Clean Energies and Fuels", in press, called by reviewers a "true scientific revolutions in chemistry", the first achieving exact representation of experimental molecular data and predicting new energies and fuels).

PROCEEDINGS

Santilli has organized over TWENTY INTERNATIONAL MEETINGS, of which five at Harvard University, and the others in the U. S. A., Italy, France, Yugoslavia, Greece, Russia, the last meeting having occurred at the Academia Sinica in Beijing in 1997.

Santilli is the editor of over FIFTY VOLUME OF CONFERENCE PROCEEDINGS

HONORS

1. Santilli is the sole scientist in history who was capable of discovering a series of structural generalizations of pre-existing mathematics based on generalized units and products, and then apply them to a series of structural generalizations of physics, superconductivity, chemistry, biology, astrophysics and cosmology. By comparison, numerous other scientists discovered new "individual" mathematical structures (such as Hamilton and his quaternion, Jordan and his algebras, Lie and his theory), but not a comprehensive structural generalization of the entire mathematical and physical knowledge as achieved by Santilli. Numerous theories now carry his name, such as: Santilli's isounits and isoproducts; Santilli's iso-, geno-, and hyper-numbers and their isoduals; Hamilton-Santilli iso-, geno- and hyper mechanics; Lie-Santilli iso-, geno-, and hyper theories; Lorentz-Poincare'-Santilli iso-, geno-, and hyper-symmetry; Minkowski-Santilli iso-, geno- and hyper-geometries; Santilli's iso-, geno-, and hyper-symplectic geometries; Heisenberg-Santilli iso-, geno- and hyper equations; Pauli-Santilli iso-, geno- and hyper matrices; Schroedinger-Santilli iso-, geno- and hyper-momentum; Santilli's hadronic energy; Santilli's magnecules; Santilli's magnegas; etc. An inspection of the data-base on quotations indicate that Santilli is one of the most quoted author at this moment. Besides thousands of papers quoting Santilli, five monographs have bene published by various authors with Santilli's name in the title.The inclusion of vast plagiarisms of Santilli's work in various scientific journals generally done in full knowledge of their editors (such as the river of papers on q-deformations without quotations of their origination by Santilli in 1967 and virtually all generalizations of Lie-quantum structures which are a particular case of Santilli's Lie-admissible structures due to their proved direct universality), there is no "individual" scientist today whose influence on contemporary science can even partially compare with that by Santilli.

2. Because of the above achievements SANTILLI has BEEN NOMINATED BY THE ESTONIA ACADEMY OF SCIENCES AMONG THE MOST ILLUSTRIOUS APPLIED MATHEMATICIANS OF ALL TIMES, jointly with Gauss, Weyerstrass, Hamilton, Jordan, Lie, etc.). In particular, Santilli is the ONLY scholar of Italian origin appearing in the entire list.

3. A Lecture Hall in a Research Institute in Australia has been called "Santilli's Lecture Hall";

4. Santilli has received a GOLD MEDAL from the University of Orleans for his achievements in Science and various similar honors from several scientific academies;

5. Santilli has been nominated for the NOBEL PRIZE IN PHYSICS by numerous scholars around the world since 1985 for his construction of Hadronic mechanics and other motivations, and he has been recently nominated for the NOBEL PRIZE IN CHEMISTRY for his construction of Hadronic chemistry and his discovery of the new chemical species of magnecules.

National
Technical
Systems

Engineering Laboratories
P.O. Box 857
North Highlands, CA 95660-0857
Tel: (916) 779-3100

June 23, 1998

INSTITUTE FOR BASIC RESEARCH
P.O. Box 1577
Palm Harbor, FL 34682

Attn: Dr. Ruggero Maria Santilli, President
813-548-0918
813-549-8138 FAX

Subject: Analysis Results per Toups Technology Requirements in PO No. 1052P and Your Letter Dated June 22, 1998.

Dear Dr. Santilli:

Thank you for the opportunity to provide analytical data on AquaFuel™. Attached are all gas chromatograph/mass spectrometer (GC/MS) and concomitant gas chromatograph/infrared spectrometer (GC/IR) data that we obtained for the unfiltered sample (the first analytical run that you observed) which you do not already have. Our blank runs obtained before and after the analyses show no high mass spectra, thus proving now that the high molecular weight species found were actually in the AquaFuel™ sample. I was hesitant to make that claim prior to having this data because I did not want to lead you into a "Polywater" type of situation similar to the one that trapped those unfortunate Russian scientists.

Search results, using a library of 138,000 chemical compounds, did not indicate any matches with this high molecular weight species found in AquaFuel™. Based on the limitations of our equipment and our inability to find a library match, the identity of this mysterious AquaFuel™ ingredient is still an unknown.

Your most recent request for support unfortunately exceeds the capabilities of our equipment. In the interest of continuing to provide you with our best efforts, I am recommending another laboratory in this area that specializes in sophisticated mass spectral equipment:

Alta Analytical Lab, Inc.
5070 Robert J Mathews Pkwy.
El Dorado Hills, CA 95762-5702
916-933-1640
Dr. John Cornachia

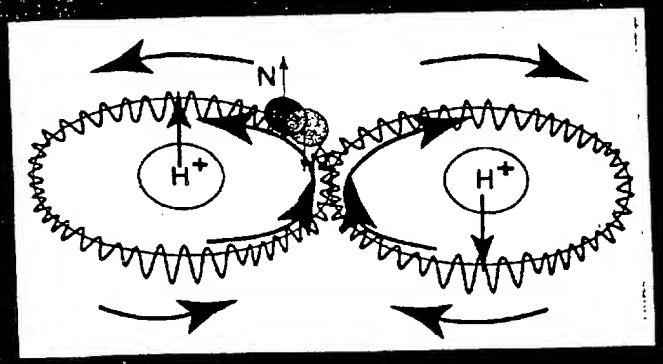
I also have sent Victor Alfano, NTS Saugus, several AquaFuel™ combustion test ideas that Paul Lieberman suggested. These tests may further corroborate the energy data you already have.

I am returning the gas cylinder to Toups Technology which has been baked at 50°C, evacuated while hot, and back-filled with dry nitrogen to ~20 psia.

NATIONAL TECHNICAL SYSTEMS

Louis A. Dee, Manager
Chemical Engineering and Analytical Chemistry

EXHIBIT 00064



Kluwer Academic Publishers
ISBN 1-4020-0087-1

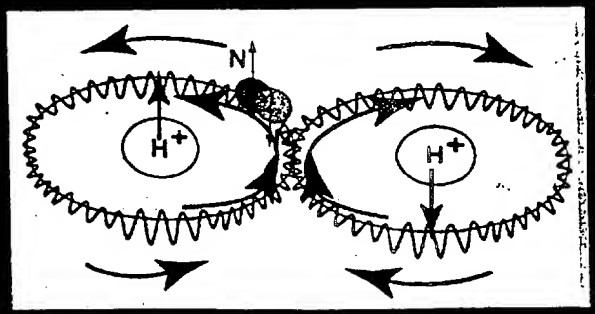
FOUNDATIONS OF HADRONIC CHEMISTRY with Applications to New Clean Energies and Fuels

Ruggero Maria Santilli

Kluwer

FOUNDATIONS OF HADRONIC CHEMISTRY with Applications to New Clean Energies and Fuels

Ruggero Maria Santilli



Kluwer Academic Publishers
Boston/Dordrecht/London
2001

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U. S. Library of Congress
Cataloging in Publication Data

Santilli, Ruggero Maria, 1935-

Foundations of Hadronic Chemistry
With Applications to New Clean Energies
and Fuels

Bibliography and Index

Additional data supplied on request

ISBN 1-4020-0087-1

Pre-production copy
following Kluwer contract signed March 7, 2001

This monograph is dedicated to

Professor T. Nejat Veziroglu,
Director,
Clean Energy Research Institute,
University of Miami, Coral Gables, Florida,
and
Editor in Chief,
International Journal of Hydrogen Energy,
Elsevier Science, Oxford, England,

because his commitment to scientific democracy for qualified inquiries and his impeccable editorial processing have permitted the birth of the new discipline presented in this monograph.

T0600T02T90006

Chapter 8

THE NEW CHEMICAL SPECIES OF MAGNECULES

1. Introduction

The only chemical species with a clearly identified bond which was known prior to the advent of hadronic chemistry was that of *molecules* and related *valence bonds*, whose identification dates back to the 19-th century, thanks to the work by Avogadro (1811), Canizzaro (1858), and several others, following the achievement of scientific measurements of atomic weights.

Various candidates for possible additional chemical species are also known, such as the delocalized electron bonds. However, none of them possess a clearly identified attractive force clearly distinct from the valence.

Also, as recalled in Chapter 7, various molecular clusters have been studied in more recent times, although they either are unstable or miss a precise identification of their internal attractive bond.

An example of unstable molecular cluster occurs when the internal bond is due to an *electric polarization* of atomic structures, that is, a deformation from a spherical charge distribution without a net electric charge to an ellipsoidical distribution in which there is the predominance of one electric charge at one end and the opposite charge at the other end, thus permitting atoms to attract each other with opposite electric polarities. The instability of these clusters then follows from the known property that the smallest perturbation causes nuclei and peripheral electrons to reacquire their natural configuration, with the consequential loss of the polarization and related attractive bond.

An example of molecular clusters without a clear identification of their internal attractive bond is given by *ionic clusters*. In fact, ionized

molecules have the *same positive charge* and, therefore, they *repel*, rather than attract, each other. As a result, not only the internal attractive bond of ionic clusters is basically unknown at this writing, but, when identified, it must be so strong as to overcome the repulsive force among the ions constituting the clusters.

In 1998, R.M. Santilli [1] submitted the hypothesis of a new type of stable clusters composed of molecules, dimers and atoms under a new, clearly identified, attractive internal bond which permits their industrial and practical use. The new clusters were called **magnecules** (patents pending) because of the dominance of magnetic effects in their formation, as well as for pragmatic needs of differentiations with the ordinary molecules, with the understanding that a technically more appropriate name would be *electromagnecules*.

Thanks to an invaluable support by Leon Toups, President of *Toups Technologies Licensing, Inc.*, a public company in Largo, Florida, the new chemical species of magnecules received, also in 1998 [1], numerous experimental verifications. Additional experimental verifications and industrial developments have been more recently conducted at *EarthFirst Technologies, Inc.*, the new denomination of *Toups Technologies Licensing, Inc.* (EFTI [2]), under the presidency of John Stanton, which company controls the world wide patent rights via its subsidiaries for their respective geographical areas *USMagnegas, Inc.*, Largo, Florida, *EuroMagnegas, Ltd.*, London England, and *AsiaMagnegas, Lim.*, Hong Kong, under the presidency of Leon Toups.

This chapter is dedicated to the review of the basic notions underlying the new chemical species of magnecules, their experimental detection, their industrial implications, and the resulting *new technology of magnetically polarized fuels* [2].

The following terminology will be used herein:

1) The word *atom* is used in its conventional meaning as denoting a stable atomic structure, such as a hydrogen, carbon or oxygen, irrespective of whether the atom is ionized or not and paramagnetic or not.

2) The word *dimer* is used to denote part of a molecule under a valance bond, such as H–O, H–C, *etc.*, irrespective of whether the dimer is ionized or not, and whether it belongs to a paramagnetic molecule or not;

3) The word *molecule* is used in its internationally known meaning of denoting stable clusters of atoms under conventional, valence, electron bonds, such as H_2, H_2O, C_2H_2, *etc.*, irrespective of whether the molecule is ionized or not, and paramagnetic or not;

4) The word *magnecule* is used to denote stable clusters of two or more molecules, and/or dimers and/or atoms and any combination thereof formed by a new internal attractive bond of primarily magnetic type

identified in detail in this chapter; the word *magnecular* will be used in reference to substances with the structure or features of magnecules;

5) The words *chemical species* are used to denote an essentially pure population of stable clusters with the same internal bond, thus implying the conventional chemical species of molecules as well as that of magnecules, under the condition that each species admits an ignorable presence of the other species.

In this chapter we study the theoretical prediction permitted by hadronic mechanics and chemistry of the new chemical species of magnecules and its experimental verifications, which were apparently presented for the first time by Santilli in memoir [1] of 1998.

2. The Hypothesis of Magnecules

The main hypothesis, studied in details in the rest of this Chapter, can be formulated as follows:

DEFINITION 8.2.1 (patent pending) [1]: **Magnecules** *in gases, liquids, and solids consist of stable clusters composed of conventional molecules, and/or dimers, and/or individual atoms bonded together by opposing magnetic polarizations of the orbits of at least the peripheral atomic electrons when exposed to sufficiently strong external magnetic fields, as well as the polarization of the intrinsic magnetic moments of nuclei and electrons. A population of magnecules constitutes a chemical species when essentially pure, i.e., when molecules or other species are contained in very small percentages in a directly identifiable form. Magnecules are characterized by, or can be identified via the following main features:*

I) Magnecules primarily exist at large atomic weights where not expected, for instance, at atomic weights which are ten times or more the maximal atomic weight of conventional molecular constituents;

II) Magnecules are characterized by large peaks in macroscopic percentages in mass spectrography, which peaks remain unidentified following a search among all existing molecules;

III) Said peaks admit no currently detectable infrared signature for gases and no ultraviolet signature for liquids other than those of the conventional molecules and/or dimers constituting the magnecule;

IV) Said infrared and ultraviolet signatures are generally altered (a feature called "mutation") with respect to the conventional versions, thus indicating an alteration (called infrared or ultraviolet mutation) of the conventional structure of dimers generally occurring with additional peaks in the infrared or ultraviolet signatures not existing in conventional configurations;

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V) Magnecules have an anomalous adhesion to other substances which results in backgrounds (blank) following spectrographic tests which are often similar to the original scans, as well as implying the clogging of small feeding lines with consequential lack of admission into analytic instruments of the most important magnecules to be detected;

VI) Magnecules can break down into fragments under sufficiently energetic collisions, with subsequent recombination with other fragments and/or conventional molecules, resulting in variations in time of spectrographic peaks (called time mutations of magnecular weights);

VII) Magnecules can accrue or lose during collision individual atoms, dimers or molecules;

VIII) Magnecules have an anomalous penetration through other substances indicating a reduction of the average size of conventional molecules as expected under magnetic polarizations;

IX) Gas magnecules have an anomalous solution in liquids due to new magnetic bonds between gas and liquid molecules caused by magnetic induction;

X) Magnecules can be formed by molecules of liquids which are not necessarily solvable in each other;

XI) Magnecules have anomalous average atomic weights in the sense that they are bigger than that of any molecular constituent and any of their combinations;

XII) A gas with magnecular structure does not follow the perfect gas law because the number of its constituents (Avogadro number), or, equivalently, its average atomic weight, varies with a sufficient variation of the pressure;

XIII) Substances with magnecular structure have anomalous physical characteristics, such as anomalous specific density, viscosity, surface tension, etc., as compared to the characteristics of the conventional molecular constituents;

XIV) Magnecules release in thermochemical reactions more energy than that released by the same reactions among unpolarized molecular constituents;

XV) All the above characteristic features disappear when the magnecules are brought to a sufficiently high temperature, which varies from species to species, called Curie Magnecular Temperature; in particular, combustion eliminates all magnetic anomalies resulting in an exhaust without magnecular features.

Magnecules are also called: **elementary** *when only composed of two molecules;* **magneplexes** *when entirely composed of several identical molecules;* and **magneclusters** *when composed of several different molecules.*

The primary objective of this chapter is, first, to study the characteristic features of magnecules from a theoretical viewpoint, and then present at least two independent experimental verifications for each feature.

The reader should keep in mind that *magnegas*, the new, clean combustible gas developed by *USMagnegas, Inc.* [2], of Largo, Florida, has precisely a magnecular structure from which it derives its name. Nevertheless, we shall identify in this chapter other gases, liquids and solids with a magnecular structure.

By denoting the conventional valence bond with the symbol "–" and the new magnetic bond with the symbol "×", examples of *elementary magnecules* in gases and liquids are respectively given by

$$\{H-H\} \times \{H-H\}, \quad \{O-O\} \times \{O-C-O\}, \ etc., \tag{8.1a}$$

$$\{C_{15}-H_{20}-O\} \times \{C_{15}-H_{20}-O\}, \ etc.; \tag{8.1b}$$

examples of *magneplexes* in gases and liquids are respectively given by

$$\{H-H\} \times \{H-H\} \times \{H-H\} \times \ldots, \ etc., \tag{8.2a}$$

$$\{H-O-H\} \times \{H-O-H\} \times \ldots, \ etc.; \tag{8.2b}$$

and examples of *magneclusters* are given by

$$\{H-H\} \times \{C-O\} \times \{O-C-O\} \times \{C=O\} \times \ldots, \ etc., \tag{8.3a}$$

$$\{C_{13}-H_{18}-O\} \times \{C_{14}-H_{12}-O_3\} \times \{C_{15}-H_{20}-O\} \times \ldots, \ etc. \tag{8.3b}$$

A generic representation of a gas magnecules requires the presence of individual atoms and dimers, such as:

$$\{H-H\} \times \{C-O\} \times H \times \{H-O-H\} \times C \times \{H-O\} \times \ldots, \ etc. \tag{8.4}$$

One of the most important features of magnecules is their anomalous release of energy in thermochemical reactions (Feature XIV of Definition 8.2.1), in view of its evident importance for the industrial development of new clean fuels such as magnegas (Sects. 7.10 and 7.11).

As we shall see in detail later on, this feature is crucially dependent on the existence within the magnecules of individual atoms, such as H, C and O, and/or individual unpaired dimers, such as H–O and H–C. In fact, at the breakdown of the magnecules due to combustion, these individual atoms and dimers coupled themselves into conventional molecules via known exothermic reactions such as

$$\begin{aligned} H + H &\rightarrow H_2 + 105 \text{ Kcal/mole}, \\ C + O &\rightarrow CO + 255 \text{ Kcal/mole}, \\ H-O + H &\rightarrow H_2O + 28 \text{ Kcal/mole}, \ etc., \end{aligned} \tag{8.5}$$

with consequential release during combustion of a large amount of energy that does not exist in fuels with a conventional molecular structure.

In reading this chapter, the reader should keep in mind that, in view of the above important industrial, consumer and environmental implications, a primary emphasis of the presentation is the study of magnecules with the largest possible number of *unpaired atoms and dimers*, rather than molecules.

In inspecting the above representation of magnecules, the reader should also keep in mind that their linear formulation in a row is used mainly for practical purposes. In fact, the correct formulation should be via *columns*, rather than rows, since the bond occurs between one atom of a given molecule and an atom of another molecule, as we shall see in detail later on.

3. The Five Force Fields Existing in Atoms

The attractive bond responsible for the creation of magnecules originates within the structure of individual *atoms*. Therefore, it is recommendable to initiate our study via the identification of all force fields existing in a conventional atomic structure.

The sole fields in the atomic structure studied by chemists prior to Ref. [1] were the intrinsic electric and magnetic fields of electrons and nuclei (see Fig. 8.1.A). It was proved a century ago that these fields can only produce *valence bonds*, thus explaining the reason why molecules were the only form of atomic clustering with a clear bond admitted by chemistry until recently.

Santilli's [1] main contribution has been the identification of a *new force field in the atomic structure*, which is sufficiently strong to permit a new chemical species.

Since the inception of atomic physics, the electron of the hydrogen atom (but not necessarily peripheral electrons of more complex atoms) has been assumed to have a spherical distribution, which is indeed the case for isolated and unperturbed atomic structures (see also Fig. 8.1.A).

However, electrons are charged particles, and all charges rotating in a planar orbit create a magnetic field in the direction perpendicular to the orbital plane, and such to exhibit the North polarity in the semi-space seeing a counter-clockwise rotation (see Fig. 8.1.B).

A main point of Ref. [1] is that the distribution in space of electron orbits is altered by sufficiently strong external magnetic fields. In particular, the latter cause the transition from the conventional spherical distribution to a new distribution with the same cylindrical symmetry of the external field, and such to exhibit magnetic polarities opposite to the external ones (Fig. 8.1.C).

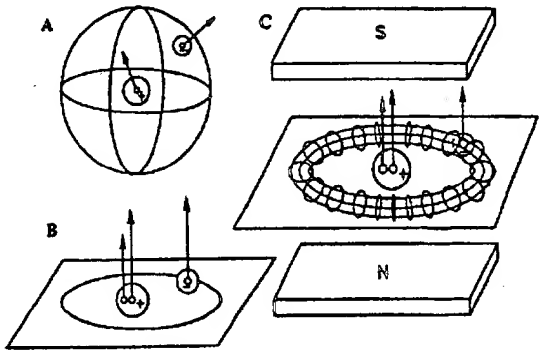

Figure 8.1. A schematic view of the force fields existing in the hydrogen atom. Fig. 8.1.A depicts an isolated hydrogen atom in its conventional spherical configuration when at absolute zero degree temperature, in which the sole force fields are given by the electric charges of the electron and of the proton, as well as by the intrinsic magnetic moments of the same particles. Fig. 8.1.B depicts the same hydrogen atom in which the orbit of the peripheral electron is polarized into a plane. In this case there is the emergence of a fifth field, the magnetic dipole moment caused by the rotation of the electron in its planar orbit. Fig. 8.1.C depicts the same hydrogen atom under an external magnetic field which causes the transition from the spherical distribution of the peripheral electron as in Fig. 8.1.A to a new distribution with the same cylindrical symmetry as that of the external field, and such to offer magnetic polarities opposite to the external ones. In the latter case, the polarization generally occurs within a toroid, and reaches the perfectly planar configuration of Fig. 8.1.B only at absolute zero degree temperature or under extremely strong magnetic fields.

Therefore, the magnetic fields of atoms *are not* solely given by the intrinsic magnetic fields of the peripheral electrons and of nuclei because, under the application of a sufficiently strong external magnetic field, atoms exhibit the additional magnetic moment caused by a polarization of the electron orbits. This third magnetic field was ignored by chemists until 1998 (although not by physicists) because nonexistent in a conventional atomic state.

As a matter of fact, it should be recalled that *orbits are naturally planar in nature, as established by planetary orbits, and they acquire a spherical distribution in atoms because of various quantum effects, e.g., uncertainties.* Therefore, in the absence of these, all atoms would naturally exhibit five force fields and not only the four fields currently assumed in chemistry.

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On historical grounds it should be noted that theoretical and experimental studies in physics of the hydrogen atom subjected to an external (homogeneous) magnetic field date to Schrödinger's times.

4. Magnecules Internal Bonds

In the preceding section we have noted that a sufficiently strong external magnetic field polarizes the orbits of peripheral atomic electrons resulting in a magnetic field which does not exist in a conventional spherical distribution. Needless to say, the same external magnetic fields also polarize the intrinsic magnetic moments of the peripheral electrons and of nuclei, resulting into *three net magnetic polarities* available in an *atomic* structure for a new bond.

When considering molecules, the situation is different because valence electrons are bonded in singlet couplings to verify Pauli's exclusion principle, as per our hypothesis of the *isoelectronium* of Chapter 4. As a result, their net magnetic polarities can be assumed in first approximation as being null. In this case, only *two* magnetic polarities are available for new bonds, namely, the magnetic field created by the rotation of paired valence electrons in a polarized orbit plus the intrinsic magnetic field of nuclei.

It should be noted that the above results persist when the inter-electron distance of the isoelectronium assumes orbital values. In this case the total intrinsic magnetic moment of the two valence electrons is also approximately null in average due to the persistence of antiparallel spins and, therefore, antiparallel magnetic moments, in which absence there would be a violation of Pauli's exclusion principle.

The calculation of these *polarized magnetic moments at absolute zero degree temperature* is elementary [1]. By using rationalized units, the magnetic moment $M_{e\text{-orb}}$ of a polarized orbit of one atomic electron is given by the general quantum mechanical law:

$$M_{e\text{-orb}} = \frac{q}{2m} L\mu, \tag{8.6}$$

where L is the angular momentum, μ is the rationalized unit of the magnetic moment of the electron, $q = -e$, and $m = m_e$.

It is easy to see that *the magnetic moment of the polarized orbit of the isoelectronium with characteristics (4.25) coincides with that of one individual electron.* This is due to the fact that, in this case, in Eq. (8.6) the charge in the numerator assumes a double value $q = -2e$, while the mass in the denominator also assumes a double value, $m = 2m_e$, thus leaving value (8.6) unchanged.

By plotting the various numerical values for the ground state of the hydrogen atom, one obtains:

$$M_{e\text{-orb.}} = M_{isoe\text{-orb.}} = 1,859.59\mu. \tag{8.7}$$

By recalling that in the assumed units the proton has the magnetic moment 1.4107 μ, we have the value [1]:

$$\frac{M_{e\text{-orb.}}}{M_{p\text{-intr.}}} = \frac{1,856.9590}{1.4107} = 1,316.33, \tag{8.8}$$

namely, *the magnetic moment created by the orbiting in a plane of the electron in the hydrogen atom is 1,316 times bigger than the intrinsic magnetic moment of the nucleus*, thus being sufficiently strong to create a bond.

It is evident that the *polarized magnetic moments at ordinary temperature* are smaller than those at absolute zero degrees temperature. This is due to the fact that, at ordinary temperature, the perfect polarization of the orbit in a plane is no longer possible. In this case the polarization occurs in a *toroid*, as illustrated in Fig. 8.2, whose sectional area depends on the intensity of the external field.

As an illustrative example, under an external magnetic field of 10 Tesla, an *isolated hydrogen atom* has a total magnetic field of the following order of magnitude:

$$M_{H\text{-tot.}} = M_{p\text{-intr.}} + M_{e\text{-intr.}} + M_{e\text{-orb.}} \approx 3,000\mu, \tag{8.9}$$

while the same hydrogen atom under the same conditions, when a component of a *hydrogen molecule* has the smaller value

$$M_{H_2\text{-tot.}} = M_{p\text{-intr.}} + M_{isoe\text{-orb.}} \approx 1,500\mu, \tag{8.10}$$

again, because of the absence of the rather large contribution from the intrinsic magnetic moment of the electrons, while the orbital contribution remains unchanged.

The above feature is particularly important for the study of magnecules and their applications because it establishes the theoretical foundations for the presence of isolated atoms in the structure of magnecules since *the magnetic bonds of isolated atoms can be at least twice stronger than those of the same atoms when part of a molecule.*

An accurate independent verification of the above calculations was conducted by M.G. Kucherenko and A.K. Aringazin [3], who obtained the following value via the use of alternative models,

$$\frac{M_{e\text{-orb.}}}{M_{p\text{-intr.}}} \approx 1,315\mu. \tag{8.11}$$

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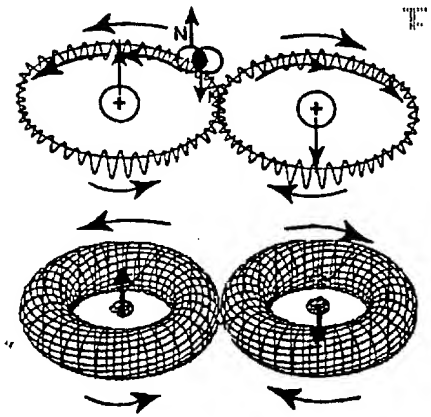

Figure 8.2. A schematic view of the magnetic fields of the isochemical model of the hydrogen molecule with isoelectronium assumed to be a stable quasi-particle. The top view represents the molecule at absolute zero degree temperature with polarization of the orbit in a plane, while the bottom view represents the molecule at ordinary temperature with a polarization of the orbit within a toroid. In both cases there is the disappearance of the *total intrinsic* magnetic moments of the electrons because they are coupled in the isoelectronium with antiparallel spin and magnetic moments due to Pauli's exclusion principle. The *lack* of contribution of the intrinsic magnetic moments of the electrons persists even when the isoelectronium has dimension much bigger than 1 fm, because the antiparallel character of the spins and magnetic moments persists, resulting in an average null total intrinsic magnetic moment of the electrons. Therefore, the biggest magnetic moment of the hydrogen molecule which can be obtained via polarizations is that of the electrons *orbits*. Note, as recalled in Sect. 4.2, the *oo*-shaped (also called figure eight) configuration has been recently proved in mathematics to be one of the most stable solutions of the N-body problem.

Needless to say, the quantized value of the angular momentum of the ground state of the conventional (unpolarized) hydrogen atom is null, $L = 0$, thus implying a null magnetic moment, $M = 0$. This occurrence confirms the well known feature that the magnetic moment of the orbit of the peripheral electron of a conventional (unpolarized) hydrogen atom is null.

Consequently, expressions (8.6)-(8.11) should be considered under a number of clarifications. First, said expressions refer to *the orbit of the peripheral electron under an external magnetic field* which implies an evident alteration of the value of the magnetic moment. Note that this external magnetic field can be either that of an electric discharge, as

in the PlasmaArcFlow reactors, or that of another polarized hydrogen atom, as in a magnecule. This occurrence confirms a main aspect of the new chemical species of magnecules, namely, that the plane polarization of the orbits of the peripheral atomic electron is stable if and only if said polarization is coupled to another because, if isolated, the plane polarization is instantly lost due to rotations with recover the conventional spheroidal distribution of the orbits.

Moreover, expressions (8.6)-(8.11) refer to the angular momentum of the orbit of the peripheral electron *polarized in a plane*, rather than that with a spherical distribution as in the conventional ground state of the hydrogen atom. The latter condition, alone, is sufficient to provide a non-null quantized orbital magnetic moment.

Finally, the value $L = 1$ needed for expressions (8.6)-(8.11) can be obtained via *the direct quantization of the plane polarization of a classical orbit*. These aspects have been studied in detail by Kucherenko and Aringazin [2] and Aringazin [8] (see Appendix 8.A). These studies clarify a rather intriguing property mostly ignored throughout the 20-th century according to which, contrary to popular beliefs, *the quantized angular momentum of the ground state of the hydrogen atom is not necessarily zero, because its value depends on possible external fields.*

It is important to note that the magnetic polarizations herein considered are *physical notions*, thus being best expressed and understood via *actual orbits* as treated above rather than *chemical orbitals*. This is due to the fact that *orbits are physical entities* actually existing in nature, and schematically represented in the figures with standing waves, in semiclassical approximation. By contrasts, *orbitals are purely mathematical notions* given by probability density. As a result, magnetic fields can be more clearly associated with orbits rather than with orbitals.

Despite the above differences, it should be stressed that, magnetic polarizations can also be derived via the *orbitals* of conventional use in chemistry. For example, consider the description of an isolated atom via the conventional Schrödinger equation

$$H|\psi\rangle = \left(\frac{p^2}{2m} + V\right)|\psi\rangle = E|\psi\rangle, \tag{8.12}$$

where $|\psi\rangle$ is a state in a Hilbert space. Orbitals are expressed in terms of the probability density $|\langle\psi| \times |\psi\rangle|$. The probability density of the electron of a hydrogen atom has a spherical distribution, namely, the electron of an isolated hydrogen atom can be found at a given distance from the nucleus with the same probability in any direction in space.

Assume now that the same hydrogen atom is exposed to a strong external homogeneous and static magnetic field B. This case requires

the new Schrödinger equation,

$$\left((p - \frac{e}{c}A)^2/2m + V\right)|\psi'\rangle = E'|\psi'\rangle, \qquad (8.13)$$

where A is vector-potential of the magnetic field B. It is easy to prove that, in this case, the new probability density $|\langle\psi'| \times |\psi'\rangle|$ possesses a *cylindrical symmetry* precisely of the type indicated above, thus confirming the results obtained on physical grounds. A similar confirmation can be obtained via the use of Dirac's equation or other chemical methods.

An accurate recent review of the Schrödinger equation for the hydrogen atom under external magnetic fields is that by A.K. Aringazin [8], which study confirms the toroidal configuration of the electron orbits which is at the foundation of the new chemical species of magnecules. A review of Aringazin studies is presented in Appendix 8.A. As one can see, under an external, strong, homogeneous, and constant magnetic fields of the order of 10^{13} Gauss = 10^7 Tesla, the solutions of Schrödinger equation of type (8.13) imply the restriction of the electron orbits within a single, small-size toroidal configuration, while the excited states are represented by the double-splitted toroidal configuration due to parity.

Intriguingly, the binding energy of the ground state of the H atom is much higher than that in the absence of an external magnetic field, by therefore confirming another important feature of the new chemical species of magnecules, that of permitting new means of storing energy within conventional molecules and atoms, as discussed in Sect. 8.9.

For magnetic fields of the order of 10^9 Gauss, spherical symmetry begins to compete with the toroidal symmetry, and for magnetic fields of the order of 10^5 Gauss or less, spherical symmetry is almost completely restored by leaving only ordinary Zeeman effects. This latter result confirms that the creation of the new chemical species of magnecules in gases as per Definition 8.2.1 requires very strong magnetic fields. The situation for liquids is different, as shown in Sect. 8.10.

The magnetic polarization of atoms larger than hydrogen is easily derived from the above calculations. Consider, for example, the magnetic polarization of an isolated atom of oxygen. For simplicity, assume that an external magnetic field of 10 Tesla polarizes only the two peripheral valence electrons of the oxygen. Accordingly, its total polarized magnetic field of orbital type is of the order of twice value (8.9), *i.e.*, about 6,000 μ. However, when the same oxygen atom is bonded into the water or other molecules, the maximal polarized magnetic moment is about half the preceding value.

Note the dominance of the magnetic fields due to polarized electron *orbits* over the intrinsic *nuclear* magnetic fields. This is due not only to the fact that the former are 1,316 times the latter, but also to the fact that nuclei are at a relative great distance from peripheral electrons, thus providing a contribution to the bond even smaller than that indicated. This feature explains the essential novelty of magnecules with respect to established magnetic technologies, such as that based on *nuclear magnetic resonances*.

Note also that a main mechanism of polarization is dependent on an external magnetic field and the force actually providing the bond is of magnetic type. Nevertheless, the ultimate origin is that of charges rotating in an atomic orbit. This illustrates that, as indicated in Sect. 8.1, the name "magnecules" was suggested on the basis of the predominant magnetic origin, as well as for the pragmatic differentiation with molecules without using a long sentence, although a technically more appropriate name would be "electromagnecules."

Needless to say, the polarization of the orbits is not necessarily restricted to valence electrons because the polarization does not affect the quantum numbers of any given orbit, thus applying for all atomic electrons, including those of complete inner shells, of course, under a sufficiently strong external field. As a consequence, *the intensity of the magnetic polarization generally increases with the number of atomic electrons*, namely, the bigger is the atom, the bigger is, in general, its magnetic bond in a magnecule.

Ionizations do not affect the *existence* of magnetic polarizations, and they may at best affect their *intensity*. An ionized hydrogen atom is a naked proton, which acquires a polarization of the direction of its magnetic dipole moment when exposed to an external magnetic field. Therefore, an ionized hydrogen atom can indeed bond magnetically to other polarized structures. Similarly, when oxygen is ionized by the removal of one of its peripheral electrons, its remaining electrons are unchanged. Consequently, when exposed to a strong magnetic field, such an ionized oxygen atom acquires a magnetic polarization which is similar to that of an unpolarized oxygen atom, except that it lacks the contribution from the missing electron. Ionized molecules or dimers behave along similar lines. Accordingly, the issue as to whether individual atoms, dimers or molecules are ionized or not will not be addressed hereon.

The magnetic polarizations here considered are also independent as to whether the substance considered is paramagnetic or not. This is evidently due to the fact that the polarization deals with the individual orbits of individual peripheral electrons, irrespective of whether paired or unpaired, belonging to a saturate shell or not. Therefore, the issue as to whether a given substance is paramagnetic or not will be ignored hereon.

Similarly, the polarizations here considered do not require molecules to have a net total magnetic polarity, which would be possible only for paramagnetic substances, again, because they act on individual orbits of individual atomic electrons.

We should also indicate that another verification of our isochemical model of molecular structures is the resolution of the inconsistency of the conventional model in predicting that all substances are paramagnetic, as illustrated in Figs. 1.4 and 1.5.

Recall that the atoms preserve their individualities in the conventional molecular model, thus implying the *individual* acquisition of a magnetic polarization under an external field, with consequential net total magnetic polarities for all molecules which is in dramatic disagreement with experimental; evidence.

By comparison, in the isochemical molecular model the valence electrons are actually bonded to each other, with consequential *oo*-shaped orbit around the respective nuclei. This implies that the rotational directions of the *o*-branches are opposite to each other. In turn, this implies that magnetic polarizations are also opposite to each other, resulting in the lack of a net magnetic polarity under an external field, in agreement with nature (see Figs. 4.5 and 8.3 for more details).

5. Production of Magnecules in Gases, Liquids and Solids

At its simplest, the creation of magnecules can be understood via the old method of magnetization of a paramagnetic metal by induction. Consider a paramagnetic metal which, initially, has no magnetic field. When exposed to a constant external magnetic field, the paramagnetic metal acquires a permanent magnetic field that can only be destroyed at a sufficiently high temperature varying from metal to metal and called the *Curie Temperature*.

The mechanism of the above magnetization is well known. In its natural unperturbed state, the peripheral atomic electrons of a paramagnetic metal have a space distribution that results in the lack of a total magnetic field. However, when exposed to an external magnetic field, the orbits of one or more unpaired electrons are polarized into a toroidal shape with end polarities opposite to those of the external field.

This mechanism is called magnetic induction, and results in a stable chain of magnetically polarized orbits from the beginning of the metal to its end with polarities North-South/North-South/North-South/ ... This chain of polarizations is so stable that it can only be destroyed by high temperatures.

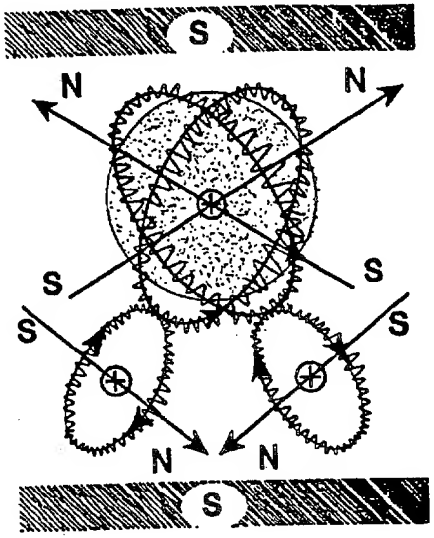

Figure 8.3. A schematic view of the resolution for the case of the water molecule of the inconsistent prediction of the conventional molecular model that water is paramagnetic (Fig. 1.5), as permitted by the Santilli-Shillady isochemical model of water molecule (Chapter 5). As one can see, the resolution is given by the impossibility for the water molecule to acquire a net magnetic polarity. Note the complexity of the geometry of the various magnetic fields which, according to ongoing research, apparently permits the first explanation on scientific record of the 105° angle between the two H–O dimers. The corresponding resolution for the case of the hydrogen is outlined in Fig. 4.5.

The creation of magnecules can be essentially understood with a similar polarization of the peripheral electron orbits, with the main differences that: no total magnetic polarization is necessary; the polarization generally apply to all electrons, and not necessarily to unpaired electrons only; and the substance need not to be paramagnetic.

To illustrate these differences, consider a diamagnetic substance, such as the hydrogen at its gaseous state at ordinary pressure and temperature. As well known, the hydrogen molecule is then a perfect sphere whose radius is equal to the diameter of a hydrogen atom, as illustrated in Fig. 8.5.A. The creation of the needed magnetic polarization requires the use of external magnetic fields capable, first, to remove the rotation of the atoms, as illustrated in Fig. 8.4.B, and then the removal of the

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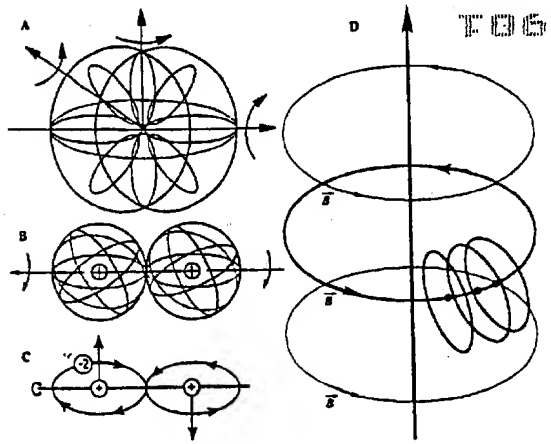

Figure 8.4. A schematic view of the main mechanism underlying the creation of magnecules, here illustrated for the case of the hydrogen molecule. It consists in the use of sufficiently strong external magnetic fields which can progressively eliminate all rotations, thus reducing the hydrogen molecule to a configuration which, at absolute zero degrees temperature, can be assumed to lie in a plane. The planar configuration of the electron orbits then implies the manifestation of their magnetic moment which would be otherwise absent. The r.h.s. of the above picture outlines the geometry of the magnetic field in the immediate vicinity of an electric arc as described in the text for the case of hadronic molecular reactors (Chapter 7). Note the *circular* configuration of the magnetic field lines around the electric discharge, the *tangential* nature of the symmetry axis of the magnetic polarization of the hydrogen atoms with respect to said circular magnetic lines, and the consideration of hydrogen atoms at *orbital distances* from the electric arc 10^{-8} cm, resulting in extremely strong magnetic fields proportional to $(10^{-8})^{-2} = 10^{16}$ Gauss, thus being ample sufficient to create the needed polarization (see Appendix 8.A for details).

internal rotations of the same, resulting in a planar configuration of the orbits as illustrated in Fig. 8.4.C.

Once the above polarization is created in two or more hydrogen molecules sufficiently near each other, they attract each other via opposite magnetic polarities, resulting in the elementary magnecules of Fig. 8.5.A. Additional elementary magnecules can then also bond to each other, resulting in clusters with a number of constituents depending on the conditions considered.

A most efficient industrial production of gas and liquid magnecules is that via the *PlasmaArcFlow Reactors* studied in the preceding Chapter [2]. As we shall see via the experimental evidence presented below, said reactors can produce an essentially pure population of gas and liquid magnecules without appreciable percentages of molecules directly detectable in the GC- or LC-MS.

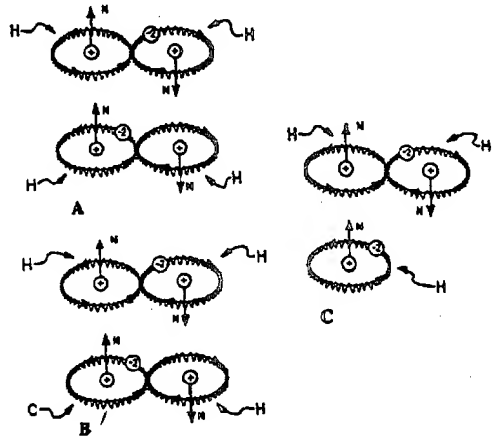

Figure 8.5. A schematic view of the simplest possible bonds due to the polarization of the orbits of peripheral electrons. Case A illustrates the *elementary hydrogen magnecule*, namely, that composed of two hydrogen molecule under said magnetic bond. Note that the magnecule has atomic weight very close to that of the helium. Therefore, the detection in a GC-MS scan of a peak with 4 a.m.u., by no means, necessarily identifies the helium because the peak could belong to the elementary hydrogen magnecule. Case B illustrates a magnecule composed by a molecule and a dimer. Case C illustrates the hypothesis submitted in this monograph that the structure with 3 a.m.u. generally interpreted as a conventional "molecule" H_3 may in reality be a magnecule between a hydrogen molecule and an isolated hydrogen atom. This is due to the fact that, once the two valence electrons of the hydrogen molecule are bonded-correlated, they cannot admit the same valence bond with a third electron for numerous physical reasons, such as: the bond cannot be stable because the former is a Boson while the latter is a Fermion; the former has charge $-2e$ while the latter has charge $-e$, thus resulting in a large repulsion; etc.

The reason for these results is the intrinsic geometry of the Plasma-ArcFlow itself. With reference to Fig. 7.9, recall that this technology deals with a DC electric arc submerged within a liquid waste to be recycled. The arc decomposes the molecules of the liquid into its atomic constituents; ionizes the same; and creates a plasma of mostly ionized H, C and O atoms at about 3,500° K. The flow of the liquid through

the arc then continuously removes the plasma from the arc following its formation. Said plasma then cools down in the surrounding liquid, and a number of chemical reactions take place resulting in the formation of magnegas which bubbles to the surface of the liquid where it is collected for industrial or consumer use.

To understand the creation of a *new chemical species* defined according to Sect. 8.1 as an essentially pure population of *gas magnecules*, recall that magnetic fields are inversely proportional to the square of the distance,

$$F_{\text{magnetic}} = \frac{m_1 m_2}{r^2}. \tag{8.14}$$

Therefore, an atom in the immediate vicinity of a DC electric arc with 1,000 A and 30 V, experiences a magnetic field which is inversely proportional to the square of the *orbital* distance $r = 10^{-8}$ cm, resulting in a magnetic field proportional to 10^{16} units.

No conventional space distribution of peripheral atomic electrons can exist under these extremely strong magnetic fields, which are such to generally cause the polarization of the orbits of *all* atomic electrons, and not only those of valence type, as well as their essential polarization in a plane, rather than a toroid.

As soon as two or more molecules near each other possessing such an extreme magnetic polarization are created, they bond to each other via opposing magnetic polarities, resulting in the elementary magnecule of Fig. 8.3.A.

Moreover, as shown earlier, isolated atoms have a magnetic field with an intensity double that of the same atom when belonging to a molecule. Therefore, as soon as created in the immediate vicinity of the electric arc, individual polarized atoms can bond to polarized molecules without any need to belong themselves to a molecule, as illustrated in Fig. 8.5.C.

Finally, recall that the PlasmaArcFlow is intended to destroy liquid molecules such as that of water. It then follows that the plasma can also contain individual highly polarized molecular fragments, such as the dimer H–O. The notion of gas magnecules as per Definition 8.2.1 then follows as referred to stable clusters of molecules, and/or dimers, and/or isolated atoms under an internal attractive bond among opposing polarities of the magnetic polarization of the orbits of peripheral electrons, nuclei and electrons when the latter are not coupled into valence bonds.

Effective means for the creation of an essentially pure population of *liquid magnecules* are given by the same PlasmaArcFlow Reactors. In fact, during its flow through the DC arc, the liquid itself is exposed to the same extreme magnetic fields as those of the electric arc indicated above. This causes the creation of an essentially pure population of liquid magnecules composed of highly polarized liquid molecules, dimers of the same liquid, and individual atoms, as established by LC-MS/UVD tests.

One way to create an essentially pure population of *solid magnecules* is given by freezing the new chemical species at the liquid level and then verifying that the latter persists after defrosting, as confirmed by various tests. Therefore, the case of solid magnecules is ignored hereon for simplicity.

By denoting with the arrow ↑ the vertical magnetic polarity North-South and with the arrow ↓ the vertical polarity South-North, and by keeping the study at the absolute zero degree temperature, when exposed to the above indicated extreme magnetic fields, the hydrogen molecule H–H can be polarized into such a form that the orbit of the isoelectronium is in a plane with resulting structure $H_\uparrow - H_\downarrow$ (Fig. 8.2).

The elementary hydrogen magnecule can then be written

$$\{H_\uparrow^a - H_\downarrow^b\} \times \{H_\uparrow^c - H_\downarrow^d\}, \tag{8.15}$$

where: a, b, c, d denote different atoms; the polarized hydrogen atom $H_\uparrow^a$ is bonded magnetically to the polarized atom $H_\uparrow^c$ with the South magnetic pole of atom a bonded to the North pole of atom c; and the North polarity of atom b is bonded to the South polarity of atom d (see, again, Fig. 8.5.A). This results in a strong bond due to the flat nature of the atoms, the corresponding mutual distance being very small and the magnetic force being consequently very large. Moreover, unlike the case of the unstable clusters due to electric polarization discussed in Sect. 8.1, the above magnetic bonds are very stable because motions due to temperature apply to the bonded couple (8.15) as a whole.

For other magnecules we can then write

$$\{H_\uparrow - H_\downarrow\} \times \{C_\uparrow - O_\downarrow\}; \tag{8.16}$$

or, more generally

$$\{H_\uparrow - H_\downarrow\} \times H_\downarrow \times \{C_\uparrow - O_\downarrow\} \times \{H_\uparrow - O_\downarrow\} \times \{H_\uparrow - C_\downarrow - A - B - C \ldots\} \times \ldots, \tag{8.17}$$

where A, B, and C are generic atoms in a conventional molecular chain and the atoms without an indicated magnetic polarity may indeed be polarized but are not necessarily bonded depending on the geometric distribution in space.

Magnecules can also be formed by means other than the use of external magnetic fields. For instance, magnecules can be produced by electromagnetic fields with a distribution having a cylindrical symmetry;

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or by microwaves capable of removing the rotational degrees of freedom of molecules and atoms, resulting in magnetic polarizations. Similarly, magnecules can be formed by subjecting a material to a pressure that is sufficiently high to remove the orbital rotations. Magnecules can also be formed by friction or by any other means not necessarily possessing magnetic or electric fields, yet capable of removing the rotational degrees of freedom within individual atomic structures, resulting in consequential magnetic polarizations.

It is, therefore, expected that a number of substances which are today listed as of unknown chemical bond, may eventually result to have a magnecular structure.

Magnecules of type (8.15) may well have been detected in past mass spectrometric measurements, but believed to be the helium (because its molecular weight is very close to that of the helium). In fact, the same happens for the "molecule" H_3 which, in reality may be the magnecule of Fig. 8.5.C.

The destruction of magnecules is achieved by subjecting them to a temperature greater than the magnecules Curie Temperature which varies from magnecule to magnecule.

6. New Molecules Internal Bonds

As indicated in Sect. 8.2, and verified experimentally later on, the IR signatures of conventional molecules such as CO_2 are mutated due to the appearance of two new peaks which do not exist for the conventional molecule. By recalling that peaks in the IR signature generally represent bonds, this evidence indicates the capability by the CO_2 molecule to acquire new internal bonds in addition to those of conventional valence type.

The magnetic polarization at the foundations of magnecules predicts the existence of these new internal bonds and permits their quantitative study. Recall that external magnetic fields can polarize the orbit of valence electrons, but cannot possibly break or alter valence bonds. Recall that, consequently, sufficiently strong external magnetic fields can polarize the orbits of all atomic electrons, and not only those of the valence electrons.

Consider then a conventional molecule such as C=O. When exposed to the extreme magnetic fields as existing in the PlasmaArcFlow technology, the orbits of all internal electrons can be polarized, individually, for the carbon and the oxygen, in addition to the polarization of the two pairs of valence bonds. Note that the planes of these polarizations need not be necessarily parallel to each other, because their relative orientation dependents on the geometry at hand.

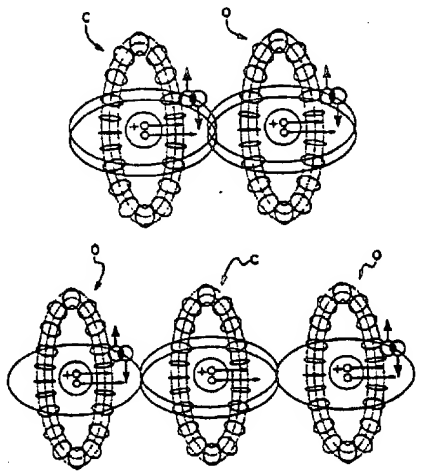

Figure 8.6. A schematic view for the cases of C=O and O–C–O of the polarization of internal atomic electrons, while preserving conventional valence bonds, and the consequential creation of new bonds in conventional molecules which are not of valence type, as later on verified experimentally via IR scans.

One of the various possible geometries is that in which the plane of the polarization of the internal electrons is perpendicular to that of the two pairs of valence bonds. In this case we have the birth of a *new bond of magnetic origin in the interior of a conventional molecule*, which is evidently given by the alignment of the two polarities North-South and North-South in the carbon and oxygen, and the consequential attraction of opposite polarities of different atoms, as illustrated in Fig. 8.6.A.

For the case of the O–C–O molecule we can evidently have two internal bonds of magnetic type in addition to the valence bonds, which are also given by the alignment of the magnetic polarities, resulting in one new bond for the O–C dimer and a second one for the C–O dimer, as illustrated in Fig. 8.6.B.

As we shall see later on, the above new internal molecular bonds have major industrial and consumer implications, inasmuch as they permit the production of fuels capable of releasing under combustion anomalous amounts of energy, with consequential reduction of pollutants in the exhaust, as already proved by magnegas.

Needless to say, the creation of new internal bonds is an extreme case of IR mutation. In reality, numerous other weaker forms of mutations

without the appearance of new peaks are possible and their study is left to the interested reader.

7. Main Features of Magnecules to be Detected

The experimental detection of gas magnecules requires the verification of a number of characteristic features of magnecules identified in Definition 8.2.1. In the following we focus the reader's attention on the main features of gas magnecules which must be verified via GC-MS tests. The remaining features will be considered later on.

Feature 1: Appearance of unexpected heavy MS peaks.

Gas magnecules are generally heavier than the heaviest molecule in a given gas. Peaks in the GC-MS are, therefore, expected in macroscopic percentages with atomic weights bigger than the heaviest molecule. As a concrete example, the heaviest molecule in magnegas in macroscopic percentage is CO_2 with 44 a.m.u. Therefore, GC-MS scans should only show background noise if set for over 44 a.m.u. On the contrary, peaks in macroscopic percentages have been detected in magnegas all the way to 1,000 a.m.u.

Feature 2: Unknown character of the unexpected MS heavy peaks.

To provide the initial premises for the detection of magnecules, all MS peaks of feature 1 should result in being "unknown" following the computer search among all known molecules, usually including a minimum of 150,000 molecules. Evidently, this lack of identification of the peaks, *per se*, does not guarantee the presence of a new chemical species.

Feature 3: Lack of IR signature of the unknown MS peaks.

Another necessary condition to claim the detection of magnecules is that the unknown MS peaks of feature 1 should have no IR signature other than that of the molecules and/or dimers constituents. This feature guarantees that said heavy peaks cannot possibly represent molecules, thus establishing the occurrence of a new chemical species. In fact, only very few and very light molecules can have such a perfect spherical symmetry to avoid IR detection, while such a perfect spherical symmetry is manifestly impossible for large clusters. In regard to the constituents we are referring to IR signatures, *e.g.*, of the CO_2 at 44 a.m.u. in a cluster having 458 a.m.u.

Feature 4: Mutation of IR signatures.

The infrared signatures of conventional molecules constituting magnecules are expected to be *mutated*, in the sense that the shape of their peaks is not the conventional one. As indicated in the preceding section, the mutations most important for industrial applications are those due to the presence of *new IR peaks* representing new internal bonds. Nevertheless, various other forms of IR mutations are possible.

Feature 5: Mutation of magnecular weights.

While molecules preserve their structure and related atomic weight at conventional temperatures and pressures, this is not the case for gas magnecules, which can *mutate* in time, that is, change their atomic weight with consequential change of the shape and location of their MS peaks. Since we are referring to gases whose constituents notoriously collide with each other, magnecules can break-down during collisions into fragments which can then recombine with other fragments or other magnecules to form new clusters.

Feature 6: Accretion or emission of individual atoms, dimers or molecules.

Magnecules are expected to experience accretion or emission of individual atoms, dimer or molecules without necessarily breaking down into parts. It follows that the peaks of Feature 1 are not expected to remain the same over a sufficient period of time for the same gas under the same conditions.

Feature 7: Anomalous adhesion.

Magnetically polarized gases have anomalous adhesion to walls of disparate nature, not necessarily of paramagnetic character, as compared to the same unpolarized gas. This is due to the well-known property that magnetism can be propagated by induction, according to which a magnetically polarized molecule with a sufficiently intense magnetic moment can induce a corresponding polarization of valence and/or other electrons in the atoms constituting the wall surface. Once such a polarization is created by induction, magnecules can have strong magnetic bonds to the indicated walls. In turn, this implies that the background of GC-MS following scans and conventional flushing are often similar to the scan themselves. As a matter of fact, backgrounds following routine flushing are often used to identify the most dominant magnecules. Notice that the magnetic polarization here considered does not require that the walls of the instrument are of paramagnetic type, since the polarization occurs for the orbits of arbitrary atoms.

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Magnetically polarized gases additionally have mutated physical characteristics and behavior because the very notion of polarization of electron orbits implies physical alterations of a variety of characteristics, such as average size. Mutations of other characteristics are then consequential.

We should finally recall that the above features are expected to disappear at a sufficiently high temperature, evidently varying from gas to gas (Curie Temperature), while the features are expected to be enhanced at lower temperature and at higher pressure, and survive liquefaction.

8. Necessary Conditions for the Correct Detection of Molecules and Magnecules

8.1. Selection of Analytic Instruments

Current technologies offer an impressive variety of analytic instruments (see, *e.g.*, Ref. [4]), which include: Gas Chromatography (GC), Liquid Chromatography (LC), Capillary Electrophoresis Chromatography (CEC), Supercritical Chromatography (SCC), Ion Chromatography (IC), Infrared Spectroscopy (IR), Raman Spectroscopy (RS), Nuclear Magnetic Resonance Spectroscopy (NMRS), X-Ray Spectroscopy (XRS), Atomic Absorption Spectroscopy (AAS), Mass Spectrometry (MS), Laser Mass Spectrometry (LMS), Flame Ionization Spectrometry (FIS), and others.

Only some of these instruments are suitable for the detection of magnecules and, when applicable, their set-up and use are considerably different than those routinely used with great success for molecules.

Among all available chromatographic equipment, that suitable for the detection of gas magnecules is the GC with column having ID of at least 0.32 mm operated according to certain criteria outlined in Sect. 8.8.3. By comparison, other chromatographs do not appear to permit the entrance of large magnecules, such as the CEC, or be potentially destructive of the magnecules to be detected, such as the IC.

Among all available spectroscopic equipment, that preferable is the IR, with the understanding that such an instrument is used in a *negative* way, that is, to verify that the magnecule considered has no IR signature. The RS may also result in being preferable in various cases, while other instruments, such as the NMRS do not appear to be capable of detecting magnecules despite their magnetic nature, evidently because NMRS are most effective for the detection of microscopic magnetic environment of H-nuclei rather than large structures. Other spectroscopic instruments have not been studied at this writing.

In regard to spectrometric equipment, the most recommendable one is the low ionization MS due to the fact that other instruments seemingly destroy magnecules at the time of their detection. The study of other spectrometric equipment is left to interested researchers. Chemical analytical methods (i.e. via chemical reactions) to *detect* gas magnecules are probably not very effective since they necessarily destroy the magnecules in reaction.

As it is well known, when used individually, the above suggested instruments have considerable limitations. For instance, the GC has a great resolution of a substance into its constituent, but it has very limited capabilities to identify them. By comparison, the MS has great capabilities to identify individual species, although it lacks the ability to separate them.

For these reasons, some of the best analytic instruments are given by the combination of two different instruments. Among them, the most recommendable one is the GC combined with the MS, and denoted GC-MS. A similar occurrence holds for the IR combined to the GC-MS. As indicated since the early parts of this Chapter, the best instrument for the detection of both molecules and magnecules in gases is the GC-MS equipped with the IRD denoted GC-MS/IRD while that for liquids is the LC-MS equipped with UVD and denoted LC-MS/UVD.

Among a large variety of GC-MS instruments, only a few are truly effective for the detection of gas magnecules for certain technical reasons identified below. The instrument which has permitted the first identification of magnecules and remains the most effective at this writing (despite its considerable age for contemporary standards) is the GC Hewlett-Packard (HP) model 5890 combined with the MS HP model 5972 equipped with a large ID column and feeding line operated at the lowest temperature permitted by the instrument (about 10° C) and the longest elusion time (about 25 min).

A secondary function of the IRD is that of identifying the *dimers constituting a magnecule*, a task which can be fulfilled by various IRD. That which was used for the original discovery of magnecules and still remains effective (again, despite its age by current standards) is the IRD HP model 5965, when operated with certain criteria identified below.

A most insidious aspect in the detection of magnecule is the protracted use of any given instrument with great success in the detection of conventional molecules, and the consequential expectation that the same instrument should work equally well for the detection of magnecules, resulting in an analysis without any real scientific value because:

i) the species to be detected may not even have entered the instrument, as it is routinely the case for small syringes and feeding lines particularly

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for liquid magnecules (which can be so big as to be visible to the naked eye, as shown in Sect. 8.10);

ii) the species to be detected may have been destroyed by the measurement itself, as it is routinely the case for instruments operated at very high temperature, or flame ionization instruments which, when used for combustible gases with magnecular structure, cause the combustion of magnecules at the very time of their detection; or

iii) the detection itself may create magnecules which do not exist in the original species, as it is the case of peaks with 3 a.m.u. discussed in Fig. 8.4.

In conclusion, the separation between a true scientific measurement and a personal experimental belief requires extreme scientific caution in the selection of the analytic instrument, its use, and the interpretation of the results.

8.2. Unambiguous Detection of Molecules

As it is well known, a *gas molecule* is identifiable by unique and unambiguous GC-MS peaks, which are distinctly different from those of any other gas molecule. In addition, this GC-MS identification can be confirmed by IRD peaks and related resonating frequencies, which are also distinctly different for different gas molecule. Additional confirmations are possible using other analytic methods, such as those based on average molecular weight, chemical reactions and other procedures.

The advent of the new chemical species of magnecules suggests a reexamination of these analytic methods and procedures so as to separate personal opinions from actual scientific identifications. Such a reexamination is warranted by the fact that, due to extended use, claims of specific molecular identifications are nowadays generally voiced via the use of only one analytic detector.

As an illustration, most contemporary analytic laboratories conduct chemical analyses on gases via the sole use of the IRD. However, *infrared detectors do not identify complete molecules, since they can only identify the bond in their dimers.* For instance, for the case of H_2O, the IRD does not identify the complete molecule, but only its dimer H–O.

This method of identification of molecules is certainly acceptable for gases whose lack of magnetic polarization has been verified by the analysts. However, the same method is highly questionable for gases of unknown origin. In fact, we shall soon show experimental evidence of clear IR signatures for molecules which have no MS identification at all, in which case the claim of such a molecule evidently has no scientific value.

The inverse occurrence is equally questionable, namely, the claim of a given molecule from its sole identification in the MS without a confirmation of exactly the same peak in the IRD. In fact, there are several MS peaks in magnetically polarized gases which may be easily identified with one or another molecule, but which have no IR signature at all at the MS value of the atomic weight, in which case the claim of molecular identification evidently has no scientific value.

Note that the great ambiguities in the separate use of disjoint GC-MS and IRD. In fact, in this case there is no guarantee or visible evidence that exactly the same peak is jointly inspected under the MS and, separately, the IRD. In fact, a given molecule can be tentatively identified in the MS at a given a.m.u., while the same molecule may indeed appear in the IRD, although at a different value of a.m.u., in which case, again, the claim to have detected a given molecule is a personal experimental belief, rather than a scientific truth.

In conclusion, *a serious scientific identification of any given molecule requires the joint use of at least two different analytic methods, both giving exactly the same result for exactly the same peak in a unique and unambiguous way, such as the detection via MS scans with unequivocal computer identifications, confirmed by IR scans without ambiguities, thus requiring the use of GC-MS equipped with IRD.*

Additional ambiguities result from the rather widespread belief that molecules are the only possible chemical species in nature, in which case small deviations from exact identifications are generally ignored for the specific intent of adapting experimental evidence to pre-existing knowledge, rather than modifying old interpretations to fit new experimental evidence. This widespread tendency is also a reason why magnecules have not been identified until now.

As an illustration, suppose that: a GC-MS equipped with IRD detects a peak with 19 a.m.u.; said peak is identified by the MS search as the water molecule with 18 a.m.u.; and the IRD confirms the presence of the HO-dimer. Under these conditions, it is almost universally accepted in contemporary analytic laboratories that said peak with 19 a.m.u. represents the water molecule, and the spurious single a.m.u. is just an "impurity" or something to be ignored, in which case, however, we do not have a true scientific identification of the species.

In fact, it is well possible that the peak at 19 a.m.u. is constituted by a highly polarized water molecule magnetically bonded to one isolated hydrogen atom with structure

$$\{H_\downarrow - O_{\uparrow\uparrow} - H_\downarrow\} \times H_\downarrow. \tag{8.18}$$

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In this case, according to our terminology, the peak at 19 a.m.u. is a magnecule and *not* a molecule, even though the MS search gives 99.99% confidence and the IR search gives 100% confidence that the species is the ordinary water molecule. After all, the magnecular bond is transparent to current IR detection, then, the latter confirms an erroneous belief.

At any rate, no claim on the peak with 19 a.m.u. can be truly scientific or otherwise credibly, unless it explains in a specific and numerical way, without vague nomenclatures, how the single a.m.u. entity is attached to the water molecule.

Recall that the valence bond requires singlet couplings to verify Pauli's exclusion principle. As a consequence, coupled pairs of valence electrons are *Bosonic states with zero spin*. Under these conditions, no nomenclature suggesting one or another type of valence can credible explain the bonding of one single H atom to the H–O–H molecule because it would imply the bond of a *Fermion with spin* 1/2 (the valence electron of the hydrogen) with a *Boson* (the coupled valence electron pair of the water), which bond is an impossibility well known in particle physics. By comparison, the magnecular hypothesis identifies the *attractive* character of the bond in a clear and unambiguous way, and then its *numerical value* (8.9).

The detection of *liquid molecules* has problems greater than those for gas molecules, because liquid magnecules can be so big to be visible by the naked eye, in which case only their conventional molecular constituents are generally permitted to enter current instruments, resulting again in a lack of real detection.

In conclusion, the separation in the identification of molecules between a true scientific process and a personal experimental belief requires extreme care before claiming that a certain peak characterizes a molecule, since possible ambiguities exist in all cases, from small to large atomic weights. In the final analysis, as stressed above, the difference between a molecule and a magnecule may be given by what is generally considered noise, or instrument malfunction.

The most unreassuring occurrence is that all GC-MS equipped with IRD identified by this author in the USA following a laborious search belong to military, governmental, or law enforcement institutions, and none of them was identified in commercial or academic laboratories. Therefore, the great majority of analytic laboratories lack the very instrument necessary for a final and unequivocal identification of a conventional *molecules*, let alone that of magnecules.

8:3. Unambiguous Detection of Magnecules

Since magnecules have properties very different from those of conventional molecules, the experimental detection of magnecules requires a special care. In particular, methods which have been conceived and developed for the detection of molecules are not necessarily effective for the detection of the different chemical species of magnecules precisely in view of the indicated differences.

The first indication of a possible *gas magnecule* is given by MS peaks with large atomic weight which cannot be explained via conventional molecular hypotheses. The second indication of a gas magnecule is given by the lack of identification of said heavy peaks in the MS following a search among all known molecules. A third indication of a gas magnecule then occurs when said unknown MS peak has no IR signature, except those of its constituents with much smaller atomic weight, which occurrence establishes the lack of a valence bond. Final identification of a gas magnecule requires the knowledge of the method used in the production of the gas and other evidence.

As it is the case also for molecules, a serious spectrographic analysis of magnecules requires GC-MS detectors necessarily equipped with IRD, because only such an instrument permits the direct test of the *same peaks* under both the MS and IR scan. Again, if the IRD operates separately from the GC-MS, the indicated joint inspection is not possible; the IRD can only detect ordinary molecular dimers; the experimental belief that the MS peak must be a molecule is then consequential.

As a concrete example verified later on with actual tests, consider the spectrographic analysis of magnegas. This is a light gas whose heaviest molecule in macroscopic percentages should be the CO_2 at 44 a.m.u. Consider now an MS peak of magnegas at 481 a.m.u. It is evident that, while small deviations could be adapted to quantum chemistry, large deviations of such an order of magnitude cannot be reconciled with established knowledge in a credible way, thus permitting the hypothesis that the MS peak in a *light* gas with 481 a.m.u. can be a magnecule. The MS scan of the peak soon establishes the impossibility for the computer to identify the peak among all existing molecules. When the GC-MS is equipped with IRD, the analyst can scan the same peak with 481 a.m.u. under the IRD and detect no signature at the 481 a.m.u. value, the only IR signature being that at 44 a.m.u. of the CO_2 as well as those of smaller molecules. The production of the gas under intense magnetic fields then confirm that the peak here considered at 481 a.m.u. is indeed a magnecule composed of a large number of ordinary light molecules, dimers and individual atoms, in accordance with Definition 8.2.1.

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Note that the IRD scan in the above test has solely identified conventional molecules without any additional unknown. Yet, the conclusion that the gas considered is solely composed of molecule would be nonscientific for numerous reasons, such as: 1) magnetic bonds are transparent to IR scans with available frequencies; 2) there is no IR detection, specifically, at 481 a.m.u.; and 3) IRD do not detect molecules, but only dimers.

Therefore, even though the IRD has detected CO_2 in the above test, the actual detection was for the C–O dimer, in which case the claim of the presence of the full CO_2 molecule is a personal opinion, and not an experimental fact.

The anomalous energy content, weigh and other features of magnegas confirm the above conclusions, because the latter can only be explained by assuming that a certain percentage of IR counts is indeed due to complete molecules, while the remaining percentage is due to unpaired dimers trapped in the magnecules. The freeing of these dimers and atoms at the time of the combustion, and their re-combination into molecules as in Eqs. (8.5) then explains the anomalous energy content.

In addition to the above basic requirements, numerous other precautions in the use of the GC-MS equipped with IRD are necessary for the detection of magnecules, such as:

i) the MS equipment should permit measurements of peaks at ordinary temperature, and avoid the high temperatures of the GC-MS column successfully used for molecules;

ii) the feeding lines should be cryogenically cooled;

iii) the GC-MS/IRD should be equipped with feeding lines of at least 0.5 mm ID;

iv) the GC-MS should be set to detect peaks at large atomic weights usually not expected; and

v) the ramp time should be the longest allowed by the instrument, *e.g.*, of at least 25 minutes.

It should be stressed that *the lack of verification of any one of the above conditions generally implies the impossibility to detect magnecules.* For instance, the use of a feeding line with 0.5 mm ID is unnecessarily large for a conventional light gas, while it is necessary for a gas with magnecular structure such as magnegas. This is due to the unique adhesion of the magnecules against the walls of the feeding line, resulting in occluded lines which prevent the passage of the most important magnecules to be detected, those with large atomic weight.

Similarly, it is customary for tests of conventional gases to use GC-MS with columns at high temperature to obtain readings in the shortest possible time, since conventional molecules are perfectly stable under the

temperatures here considered. The use of such method would equally prevent the test of the very species to be detected, because, as indicated earlier, they have a characteristic Curie Temperature at which all magnetic features are lost. Magnecules are stable at ordinary temperatures and, consequently, they should be measured at ordinary temperatures.

Along similar lines, recall that GC-MS with a short ramp time are generally used for rapidity of results. Again, the use of such a practice, which has been proven by extensive evidence to be effective for molecules, prevents clear detection of magnecules. If the ramp time is not of the order of 25 minutes, *e.g.*, it is of the order of one minute, all the peaks of magnecules generally combine into one single large peak, as described below. In this case the analyst is generally lead to inspect an individual section of said large peak. However, in so doing, the analyst identifies conventional molecules constituting the magnecule, and not the magnecule itself.

When these detectors with short ramp times are equipped with IRD, the latter identify the infrared signatures of individual conventional molecules constituting said large unique peak, and do not identify the possible IR signature of the single large peak itself. Therefore, a GC-MS with short ramp time is basically unsuited for the detection of magnecules because it cannot separate all existing species into individual peaks.

In conclusion, the experimental evidence of the above occurrences establishes the need in the detection of gas magnecules of *avoiding, rather than using, techniques and equipment with a proved efficiency for molecules*, thus avoiding the use of GC-MS without IRD, with short ramp time, high column temperatures, microscopic feeding lines, and other techniques. On the contrary, new techniques specifically conceived for the detection of magnecules should be worked out.

The conditions for scientific measurements of *liquid magnecules* via LC-MS/UVD are more stringent than those for gases, because of the great increase, in general, of the atomic weight of liquid magnecules which are generally much larger than the IR of conventionally used feeding lines, as shown below.

This implies the possible erroneous claim that magnecules do not exist because they are not detected by the LC-MS, while in reality the magnecule to be detected could not enter into at all into the instrument.

8.4. Apparent Magnecular Structure of H_3 and O_3

As it is well known, chemistry has identified in GC-MS tests clusters with 3 a.m.u., which can only be constituted of three H atoms, H_3, while

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the familiar ozone O_3 has been known since quite some time. These structures are generally assumed to be molecules, that is, to have a valence bond according to one nomenclature or another, although this author is aware of no in depth theoretical or experimental identification of the attractive force necessary to bond the third atom to a conventional molecule.

There are serious doubts as to whether such a conventional molecular interpretation will resist the test of time as well as of scientific evidence. To begin, a fundamental property of valence bonds is that *valence electrons correlate in pairs.* Since the H_3 and O_3 structures contain the molecules H_2 and O_2 in which all available valence electrons are already bonded in pairs, the belief that an additional third valence electron could be correlated to the preceding ones violates basic chemical knowledge on valence.

Moreover, we have stressed earlier that the assumption of a third valence electron bonded to a valence pair is in violation of basic physical knowledge, because it would require the bond of a Fermion (the third electron with spin 1/2) with a Boson (the singlet valence pair with spin 0) both possessing the same negative charge. Such a hypothetical bond under molecular conditions would violate various laws in particle physics, e.g., it would imply a necessary violation of Pauli-s exclusion principle since the assumed "triplet" of electrons would have *two* identical electrons in the same structure with the same energy.

In view of the above (as well as other) inconsistencies, we here assume that *the familiar H_3 and O_3 clusters are magnecules consisting of a third H and O atom magnetically bonded to the conventional H_2 and O_2 molecules, respectively, along the structure of Fig. 8.5.C.* Note that this assumption is fully in line with Definition 8.2.1 according to which a magnecule also occurs when one single atom is magnetically bonded to a fully conventional molecule.

The plausibility of the above structure is easily illustrated for the case of O_3. In fact, the oxygen is known to be paramagnetic, and the ozone is known to be best created under an electric discharge. These are the ideal conditions for the creation of a magnetic polarization of the orbits of (at least) the paramagnetic electrons. The attraction of opposing magnetic polarities is then consequential, and so is the magnetic bond of the third oxygen to the oxygen molecule, resulting in the magnecule $O_2 \times O$.

The above magnecular interpretation of O_3 is confirmed by various GC-MS detections of peaks with 32 a.m.u. in a magnetically treated gas originally composed of pure oxygen, in which case the sole possible interpretation is that of two magnetically bonded oxygen molecules, resulting in the magnecule $O_2 \times O_2$.

The plausibility of the magnecular interpretation is less trivial for the H_3 structure since hydrogen is diamagnetic. Nevertheless, the assumption remains equally plausible by recalling that a central feature of the new chemical species of magnecules is that *the magnetic polarization occurs at the level of each individual atom, and not at the level of a diamagnetic molecule, whose total magnetic moment remains null as illustrated in Fig. 8.2.*

In particular, the magnecular interpretation of the MS peaks at 3 a.m.u. is numerical and without ambiguities. Recall that GC equipment works by ionizing molecules. When testing a hydrogen gas, a number of H_2 molecules are separated into individual H atoms by the ionization itself. Moreover, the ionization occurs via the emission of electrons from a filament carrying current, which is very similar to that of the Plasma-ArcFlow Reactors producing magnecules. Under these conditions, the filament of the GC can not only separate H-molecules but also polarize them when sufficiently close to the filament. Once such polarizations are created, their bond is a known physical law, resulting in the magnecule of Fig. 8.5.C, *i.e.*

$$\{H_\downarrow - H_\uparrow\} \times H_\downarrow. \tag{8.19}$$

As one can see, under the magnecular structure the bond is manifestly attractive, very strong, and numerically identified in Eq. (8.9). Other interpretations of the peak at 3 a.m.u. are here solicited, provided that, to be credible, they are not of valence type and the internal bond is identified in a clear, unambiguous, and numerical way.

The magnecular interpretation of H_3 is confirmed by numerous GC-MS detections of a cluster with 4 a.m.u. in a magnetically treated gas which originally was composed by pure hydrogen, under which conditions such a peak can only be constituted by two hydrogen molecules resulting in the magnecule $H_2 \times H_2$ illustrated in Fig. 8.5.A.

It is an easy prediction that numerous peaks detected in contemporary GC-MS or LC-MS equipment may need a magnecular re-interpretation since, as indicated earlier, the method of detection itself can create magnecules. This is typically the case when the comparison of a given MS cluster with the actual peak of a given molecules contains additional lines.

As a specific example, when the peak representing a hexanal molecule (whose heaviest constituent has 100 a.m.u.) contains additional lines at 133 a.m.u., 166 a.m.u., and 207 a.m.u., it is evident that the latter lines cannot cluster with the hexanal molecule via valence bond. The plausibility of the magnecular interpretation is then evident.

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For copies of the GC-MS scans mentioned in this section, which are not reproduced here for brevity, we suggest the interested reader to contact the author.

8.5. Need for New Analytic Methods

In closing, we should stress that the methods for the detection and identification of magnecules are at their infancy and numerous issues remain open at this writing (spring 2001). One of the open issues relates to several detections in magnegas of IR signatures apparently belonging to complex molecules, such as light hydrocarbons, while such molecules have not been identified in the MS scans. This occurrence creates the realistic possibility that certain complex magnecules may indeed have an IR signature in view of their size. More specifically, as indicated earlier, magnecules are assumed to be transparent to currently available IRD because their inter-atomic distance is expected to be 10^4 times smaller than the inter-atomic distance in molecules, thus requiring test frequencies which simply do not exist in currently available IRD.

However, such an argument solely applies for magnecules with small atomic weight, such as the elementary magnecules of Fig. 8.5. On the contrary, magnecules with heavy atomic weight may well have an IR signature and, in any case, the issue requires specific study.

This possibility is confirmed by the fact that magnegas is created via underliquid electric arcs whose plasma can reach up to 10,000° K. The insistence that light hydrocarbons could survive in these conditions, let alone be created, is not entirely clear. This direct observation is confirmed by the fact that no hydrocarbon has been detected in the combustion of magnegas. In fact, the cars running on magnegas (as reviewed in the preceding Chapter) operate without catalytic converter. Direct analysis of the combustion exhaust show a *negative count* of hydrocarbons, that is, the exhaust contains less hydrocarbons than the local atmosphere which is used for basic calibration of the instrument.

In summary, we have a case in which light hydrocarbons are seemingly indicated by IR scans to exist in small percentages in magnegas, while no hydrocarbon has ever been identified in the MS scans, no hydrocarbon is expected to survive at the extreme temperatures of the electric arcs used for their production, and no hydrocarbon has been detected in the combustion exhaust.

These occurrences illustrate again that the identification of conventional molecules via the sole use of IR scans or, equivalently, the sole use of MS scans, is, in general, a mere personal opinion without scientific foundations.

9. Experimental Evidence of Gas Magnecules

9.1. Conventional Chemical Composition of Magnegas Used in the Tests

As it is well known, the underwater arc was developed in the mid of the 19-th century. The combustible character of the gas produced by underwater arcs was discovered by sailors of the same period who used to ignite the bubbles of gas surfacing from undersea arcs.

Numerous patents were subsequently obtained on the production of a combustible gas from underwater arcs (see, *e.g.*, U.S. patents [5]). Their main differences relate to the efficiency of the production, the CO_2 and energy content, and other aspects. The technology achieved industrial maturity only recently via the PlasmaArcFlow (patent and patents pending), as reviewed in the preceding chapter.

As indicated earlier in this chapter, an efficient way to produce an essentially pure population of gas magnecules is the production of a combustible gas via an electric arc between carbon electrodes submerged within a liquid.

All these gases are called "magnegas" because they have a magnecular structure irrespective of the liquid and the method used for their production.

The version of magnegas used in the tests reviewed in this section was produced via an electric arc between carbon electrodes submerged within ordinary tap water. According to several chemical analyses conducted at NASA and other laboratories, such a gas has the following *conventional chemical composition*:

$$50\%\ H_2,\quad 40\%\ CO,\quad 9\%\ CO_2,\ \text{traces of}\ O_2\ \text{and}\ H_2O. \tag{8.20}$$

Therefore, the maximal chemical constituent in macroscopic percentage of this particular type of magnegas is given by CO_2 with 44 a.m.u.

In regard to preceding publications of direct relevance for the detection of magnecules, we recall that, as indicated earlier, the "H_3" structure is routinely detected in GC-MS analyses of hydrogen base gases. Some of its recent chemical study can be found in Ref. [6] and quoted literature. However, the physical reasons for the impossibility to have a valence bond and the consequential new structure as per Fig. 8.5.C do not appear to be identified in Ref. [6].

Similarly, there exist numerous theoretical and experimental studies in the chemical literature on molecular magnetic properties, such as those in Refs. [7] and quoted literature. These studies refer to "global" magnetic properties of conventional "molecule" and none of them appears to identify a "new chemical species." By contrast, the studies present in

this Chapter refers to the magnetic fields of "individual atoms" and their capability to form a "new chemical species" beyond that of molecules.

The author (a physicist) would gratefully appreciate receiving from colleagues copies of papers more directly related to the use of magnetic fields of the "orbits of peripheral atomic electrons" for the creation of a "new chemical species" beyond that of molecules for proper quotation of the related literature in possible new edition of this monograph.

9.2. GC-MS/IRD Measurements of Magnegas at the McClellan Air Force Base

Santilli [1] had predicted that gases produced from underwater electric arcs had the new chemical structure of magnecules as clusters of molecules, dimers and individual atoms as per Definition 8.2.1, in which case conventional chemical structure (8.20) is valid only in first approximation.

Following a laborious search, Santilli [*loc. cit.*] located a GC-MS equipped with IRD suitable to measure magnecules at the *McClellan Air Force Base* in North Highland, near Sacramento, California. Thanks to the invaluable assistance and financial support by Leon Toups, President, of *Toups Technologies Licensing, Inc.*, of Largo, Florida, GC-MS/IRD measurements were authorized at that facility on magnegas with conventional chemical structure (8.20).

On June 19, 1998, Santilli visited the analytic laboratory of *National Technical Systems* (NTS) located at said *McClellan Air Force Base* and using instruments belonging to that base. The measurements on magnegas were conducted by analysts Louis A. Dee, Branch Manager, and Norman Wade who operated an *HP GC model 5890, an HP MS model 5972, equipped with an HP IRD model 5965*. Upon inspection at arrival, the instrument met all conditions indicated in the preceding sections then, and only then, measurements were permitted.

Thanks to a professional cooperation by the NTS analysts, the equipment was set at all the unusual conditions indicated in Sect. 8.8.3. In particular, the equipment was set for the analytic method VOC IRMS.M utilizing an HP Ultra 2 column 25 m long with a 0.32 mm ID and a film thickness of 0.52 μm. It was also requested to conduct the analysis from 40 a.m.u. to the instrument limit of 500 a.m.u. This condition was necessary to avoid the expected large CO peak of magnegas at 28 a.m.u.

Moreover, the GC-MS/IRD was set at the low temperature of 10°C; the biggest possible feeding line with an ID of 0.5 mm was installed; the feeding line itself was cryogenically cooled; the equipment was set at the longest possible ramp time of 26 minutes; and a linear flow velocity of

50 cm/sec was selected. A number of other technical requirements are available in the complete documentation of the measurements.

The analysts first secured a documentation of the *background* of the instrument prior to any injection of magnegas (also called *blank*). Following a final control that *all* requested conditions were implemented, the tests were initiated. The results, reported in part via the representative scans of Figs. 8.7 to 8.12, constitute the first direct experimental evidence of the existence of magnecules in gases.

After waiting for 26 minutes, sixteen large peaks appeared on the MS screen between 40 and 500 a.m.u. as shown in Fig. 8.7. Each of these sixteen MS peaks resulted to be "unknown," following a computer search of database on all known molecules available at *McClellan Air Force Base*, as illustrated in Fig. 8.8 No identifiable CO_2 peak was detected at all in the MS spectrum between 40 and 500 a.m.u., contrary to the presence of 9% of such a molecule in magnegas as per conventional analyses (8.20).

Upon the completion of the MS measurements, exactly the same range of 40 to 500 a.m.u. was subjected to IR detection. As expected, none of the sixteen peaks had any infrared signature at all, as shown in Fig. 8.9. Furthermore, the IR scan for these MS peaks shows only one peak, that belonging to CO_2, with additional small peaks possibly denoting traces of other substances.

Note that the IR signature of the other components, such as CO or O_2 *cannot* be detectable in this IR test because their atomic weights are below the left margin of the scan. In addition, the IR peak of CO_2 is itself mutated from that of the unpolarized molecule, as shown in Fig. 8.10. Note that the mutation is due to the appearance of *two new peaks* which are absent in the conventional IR signature of CO_2, exactly as expected, thus confirming the hypothesis of new internal bonds as submitted in Fig. 8.6.

Note also in Fig. 8.10 that the computer interprets the IR signature as that belonging to CO which interpretation is evidently erroneous because CO is outside of the selected range of a.m.u.

All remaining small peaks of the IR scan resulted to be "unknown," thus being possible magnecules, following computer search in the database of IR signatures of all known molecules available at the *McClellan Air Force Base*, as illustrated in Fig. 8.11.

Following the removal of magnegas from the GC-MS/IRD, the background continued to show the same anomalous peaks of Fig. 8.7, and reached the configuration of Fig. 8.12 only after a weekend bakeout with an inert gas. Note that the latter background is itself anomalous because the slope should have been the opposite of that shown. The background

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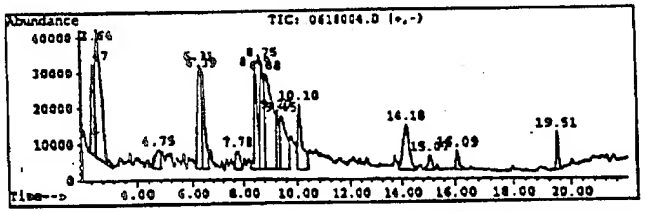
Information from Data File:
File       : C:\HPCHEM\1\DATA\0618004.D
Operator   : NAW
Acquired   : 18 Jun 98   3:01 pm using AcqMethod VOC_IRMS
Sample Name: TOUP'S TECH
Misc Info  : 1ML LOOP; 18C @ ULTRA COLUMN
Vial Number: 1
CurrentMeth: C:\HPCHEM\1\METHODS\DEFAULT.M
```



Retention Time	Area	Area %	Ratio %
Total Ion Chromatogram			
2.474	1753306	5.386	32.724
2.646	5091514	15.641	95.030
4.754	641528	1.971	11.974
6.307	2717749	8.411	51.098
6.390	2211258	6.793	41.272
7.702	592472	1.820	11.058
8.456	2357396	7.241	43.999
8.754	2764829	8.555	51.977
8.882	5357812	16.460	100.000
9.265	1133609	1.452	20.975
9.448	2421236	7.438	45.191
10.036	1946292	5.979	36.326
10.177	2129791	6.543	39.751
15.072	435208	1.337	8.123
16.085	389822	1.198	7.276
19.509	577433	1.774	10.777

Figure 8.7. A reproduction of the MS peaks providing the *first experimental evidence of the existence of magnecules* identified on June 19, 1998, by analysts *Louis A. Dee* and *Norman Wade* of the branch of *National Technical; Systems* (NTS) located at the *McClellan Air Force Base* in North Highland, near Sacramento, California, with support from *Toups Technologies Licensing, Inc.* (TTL) of Largo, Florida. The scan is restricted from 40 a.m.u to 500 a.m.u. The peaks refer to magnegas produced via an electric arc between consumable carbon electrodes within ordinary tap water with conventional chemical composition (8.20). Therefore, only the CO_2 peak was expected to appear in the scan with any macroscopic percentage, while no CO_2 was detected at all in the MS scan.

finally recovered the conventional shape only after flushing the instrument with an inert gas at high temperature.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Library Searched : C:\DATABASE\WILEY138.L
Quality          : 37
ID               : Tris(methylseleno)(13C)methane
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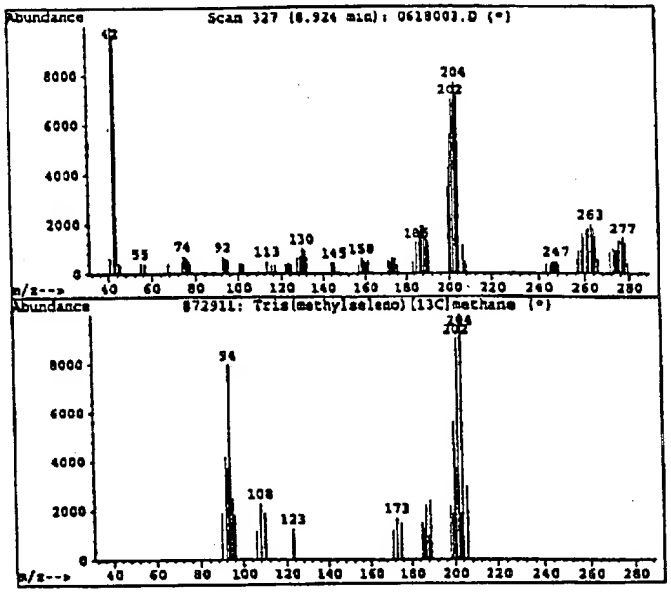

Figure 8.8. A representation of *the first experimental evidence at NTS that the peaks of Fig. 8.7 are "unknown."* The peak at the top is at 8.924 minutes, and that at the bottom shows the lack of its identification by the computer search. Note that the best fit identified by the computer does not match the peak considered. Moreover, the identified substance (methylseleno) cannot possibly exist in magnegas because of the impossible presence of the necessary elements. The same situation occurred for all remaining fifteen peaks of Fig. 8.7.

9.3. GC-MS/IRD Tests of Magnegas at Pinellas County Forensic Laboratory

Measurements on the same sample of magnegas tested at NTS were repeated on July 25, 1998, via a GC-MS/IRD located at the *Pinellas County Forensic Laboratory* (PCFL) of Largo, Florida, with support from *Toups Technologies Licensing, Inc.*

The equipment consisted of a *HP GC model 5890 Series II*, an *HP MS model 5970* and an *HP IRD model 5965B*. Even though similar to the equipment used at NTS, the PCFL equipment was significantly different

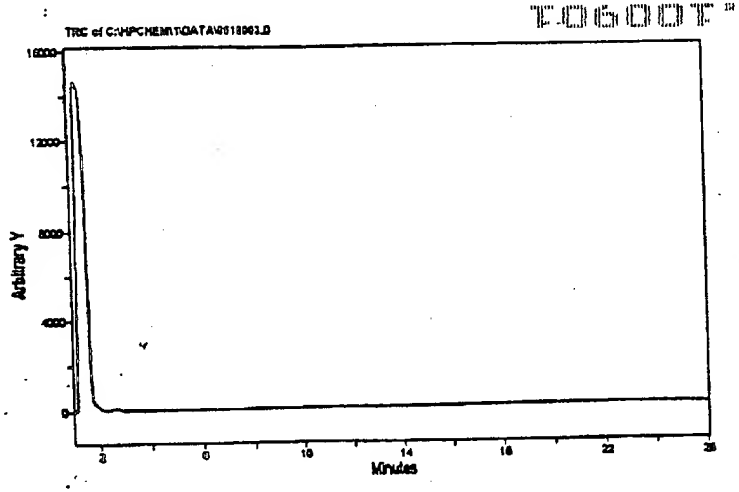

Figure 8.9. The first experimental evidence at NTS of the lack of IR signature of MS peaks. The evidence establishes the existence of large peaks in the MS that have no IR signature at all. The only identified IR signature, that for CO_2, refers to the *constituents* of the peaks of Fig. 8.7. In the above figure only the IR signature of CO_2 appears because the scan was from 40 a.m.u. to 500 a.m.u. and, as such, could not include the IR signatures of other molecules such as O_2 and CO (H_2 has no IR signature).

inasmuch as the temperature had to be increased from 10°C to 55°C and the ramp time reduced from 26 to 1 minute. The latter reduction implied the cramping of all peaks of Fig. 8.7 into one single large peak, a feature confirmed by all subsequent GC-MS tests with short ramp time.

Despite these differences, the test at PCFL, reported in part via the representative scans of Figs. 8.13 to 8.18, confirmed *all* features of magnecules first detected at NTS. In addition, the tests provided the experimental evidence of additional features.

Following Santilli's request [1], the analysts conducted *two* MS tests of the *same* magnegas at *different times* about 30 minutes apart. As one can see in Figs. 8.13 and 8.14, *the test at PCFL provided the first experimental evidence of mutation in time of the atomic weight of magnecules.* In fact, the peak of Fig. 8.13 is macroscopically different than that of Fig. 8.14.

This difference provides evidence that, when colliding, magnecules can break down into ordinary molecules, atoms, and fragments of mag-

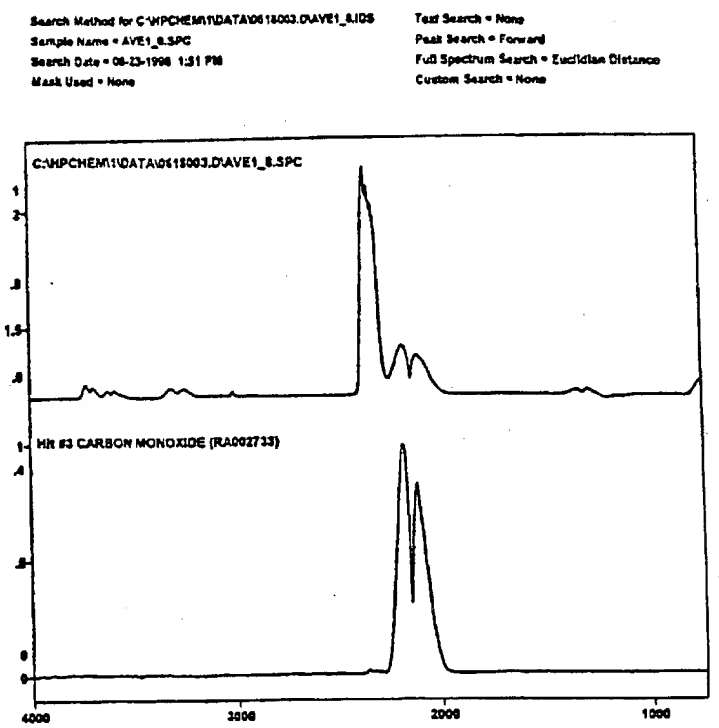

Figure 8.10. The first experimental evidence at NTS on the mutation of the IR signature of magnetically polarized conventional molecules, here referring to the CO_2 (top) compared to the result of the computer search (bottom). Note that the known, double-lobe peak of CO_2 persists in the detected peak with the correct energy, and only with decreased intensity. Jointly, there is the appearance of *two new peaks,* which are evidence of *new internal bonds within the conventional CO_2 molecule.* This evidently implies an increased energy content, thus establishing experimental foundations for the new technology of magnetically polarized fuels such as magnegas [2].*Note that the computer interprets the IR signature as that of CO, which is erroneous since CO is out of the selected range of detection.*

neclusters, which then recombine with other molecules, atoms, and/or magnecules to form new clusters. The same scan provides first experimental evidence of the accretion or loss by magnecules of individual atoms, dimers and molecules, as discussed later on.

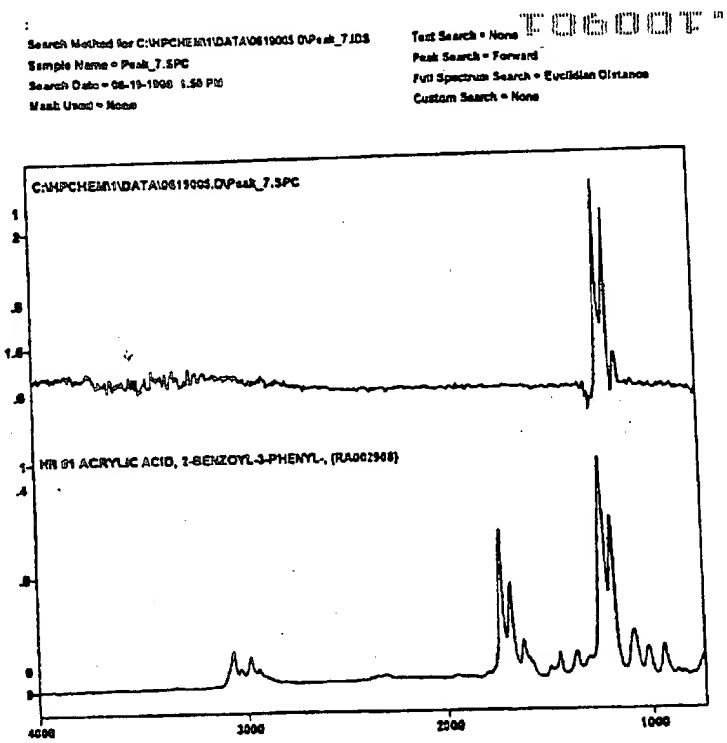

Figure 8.11. A reproduction of the lack of identification in the computer search of small peaks in the IR scan, which can therefore be additional magnecules, or IR signatures of the magnecules appearing in the MS scan.

Figure 8.15 depicts the failure by the GC-MS/IRD to identify the peaks of Figs. 8.13 and 8.14 following a search in the database among all known molecules.

Figure 8.16 provides an independent confirmation that the IR scan of Fig. 8.9, namely, that the MS peaks, this time of Figs. 8.13 and 8.14, have no IR signature except for the single signature of the CO_2. However, the latter was not detected at all in said MS scans. Therefore, the CO_2 detected in said IR scan is a *constituent* of the new species detected in Figs. 8.13 and 8.14. The lack of IR signature of the MS peaks confirms that said peaks *do not* represent molecules.

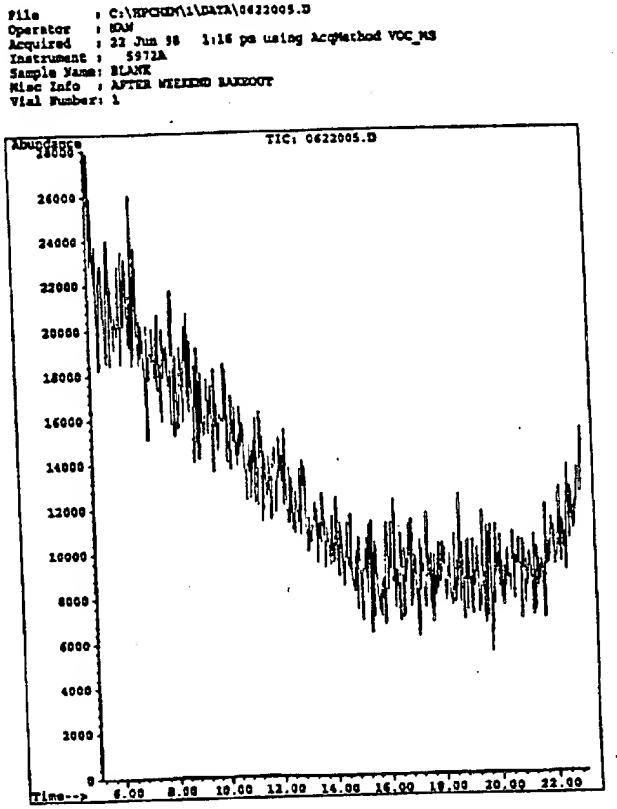

Figure 8.12. A view of the background of the preceding tests following a weekend bakeout.

Figure 8.17 confirms in full the mutated IR signature of CO_2 previously identified in Fig. 8.10, including the important presence of two new peaks, with the sole difference that, this time, the computer correctly identifies the IR signature as that of carbon dioxide.

Figure 8.18 presents the background of the instrument after routine flushing with an inert gas, which background essentially preserves the

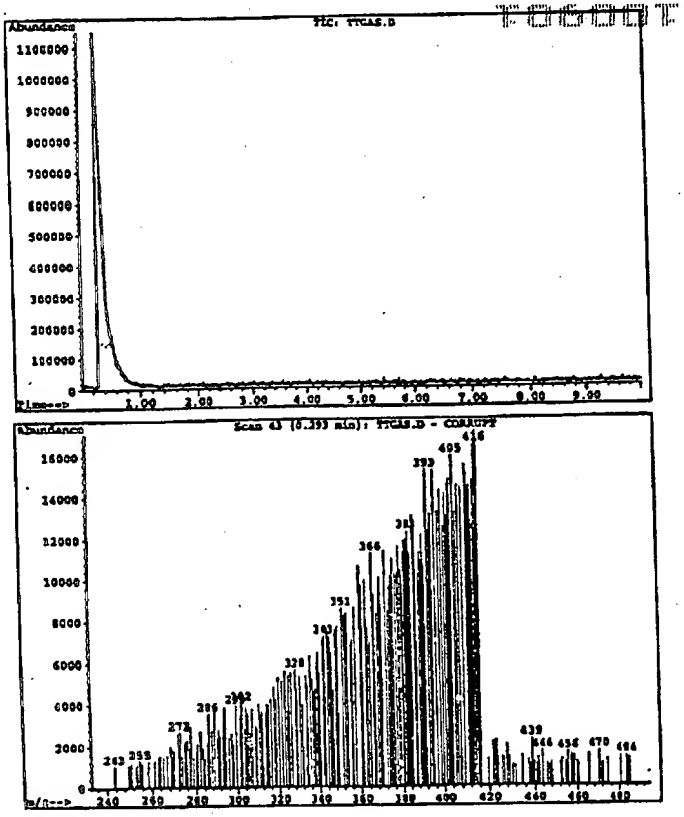

Figure 8.13. A view of the Total Ion Count (top) and MS spectrum (below) of magnegas conducted on July 25, 1998, via a HP GC-MS/IRD at the *Pinellas County Forensic Laboratory* (PCFL) of Largo, Florida, under support from *Toups Technologies Licensing, Inc.* (TTL) also of Largo, Florida. The scan is restricted to the range 40 a.m.u to 500 a.m.u. and confirm all results of the preceding NTS tests.

peaks of the MS scans, thus confirming the unique adhesion of magnecules to the instrument walls.

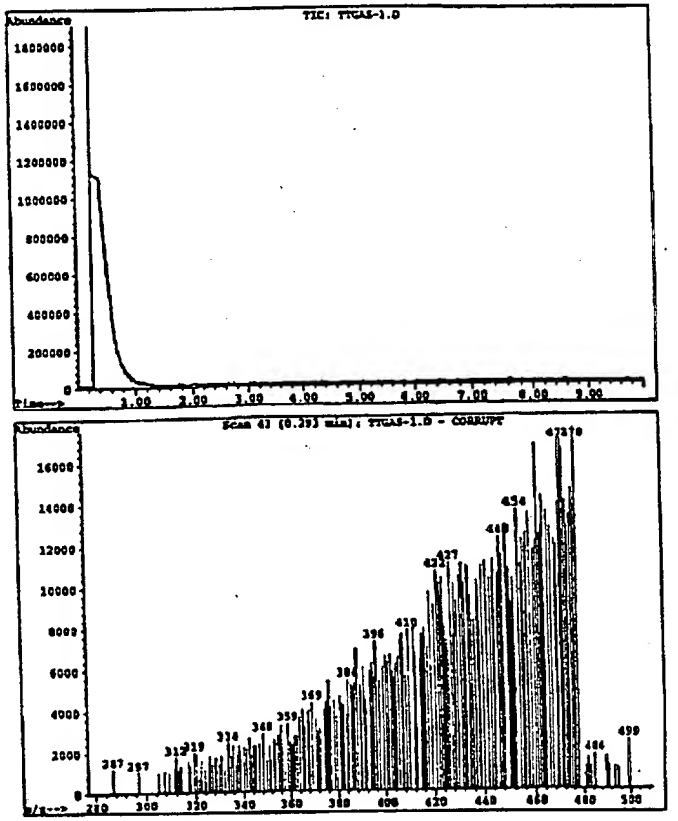

Figure 8.14. A repetition of the scan of the preceding figure conducted at PCFL in the same sample of magnegas on the same instrument and under the same conditions, but 30 minutes later. The scan provides *the first experimental evidence of the mutation of atomic weight of magnecules*, as one can see from the variation of the peaks of this figure compared with that of the preceding figure.

9.4. Interpretations of the Results

A few comments are now in order for the correct interpretation of the results. First, note in the GC-MS/IRD scans that the CO_2 detected in the IRD has no counterpart in the MS scans, while none of the peaks in the MS have a counterpart in the IR scans. Alternatively, the CO_2 peak

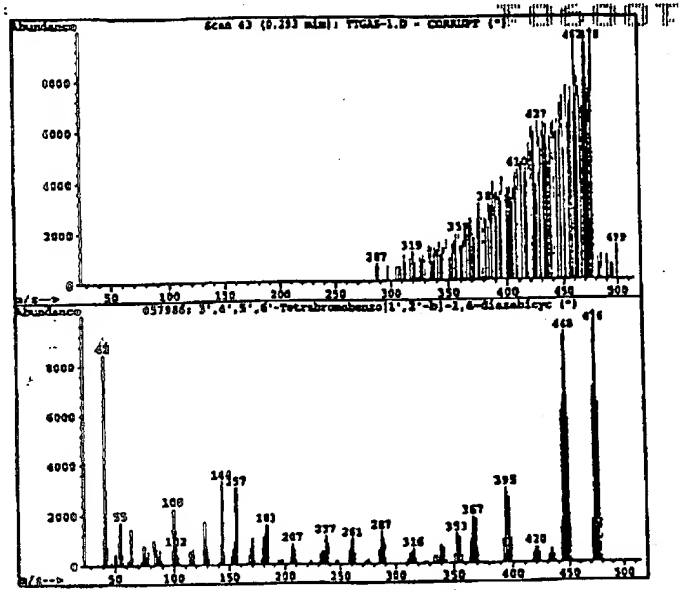

Figure 8.15. Lack of identification by the computer of the GC-MS/IRD at PCFL of the MS peaks of the preceding two scans following search among the database on all available molecules.

detected in the IR scans of Figs. 8.10 and 8.17 *does not* correspond to any peak in the MS scans in Figs. 8.7, 8.13 and 8.14. Therefore, said IR peak identifies a *constituent* of the MS clusters, and not an isolated molecule.

Moreover, the IR scan was done for the entire range of 40 to 500 a.m.u., thus establishing that said IR peak is the sole conventional constituent in macroscopic percentage in said a.m.u. range of *all* MS peaks, namely, the single constituent identified by the IRD is a constituent of all MS peaks.

It should also be noted that, as recalled earlier, the IR only detects *dimers* such as C–O, H–O, *etc.*, and does not detect complete molecules. Therefore, the peak detected by the IRD *is not* sufficient to establish the presence of the complete molecule CO_2 unless the latter is independently identified in the MS. Yet the MS scan does not identify any peak for the CO_2 molecule, as indicated earlier. Despite that, the presence in the

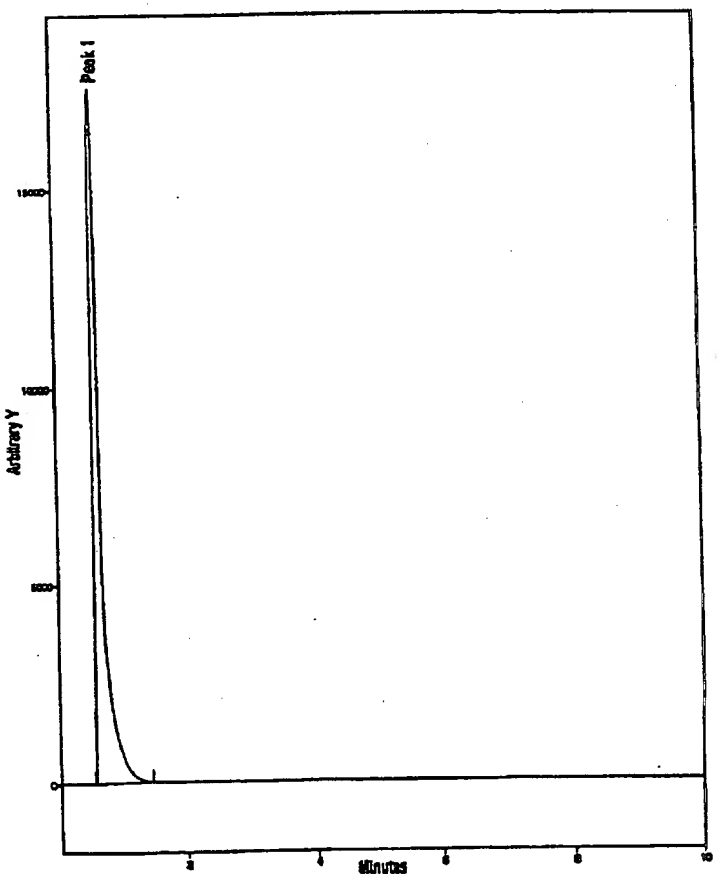

Figure 8.16. A confirmation of the lack of IR signature of the peaks of Figs. 8.13 and 8.14, as occurred for Fig. 8.9, which establishes that the MS peaks of Figs. 8.13 and 8.14 cannot have a valence bond, thus constituting a new chemical species.

MS peaks of complete molecules CO_2 cannot be ruled out. Therefore, the most plausible conclusion is that the MS peaks represent clusters composed of a percentage of C–O dimers and another percentage of CO_2 molecules, plus other dimers, and/or molecules, and/or atoms with

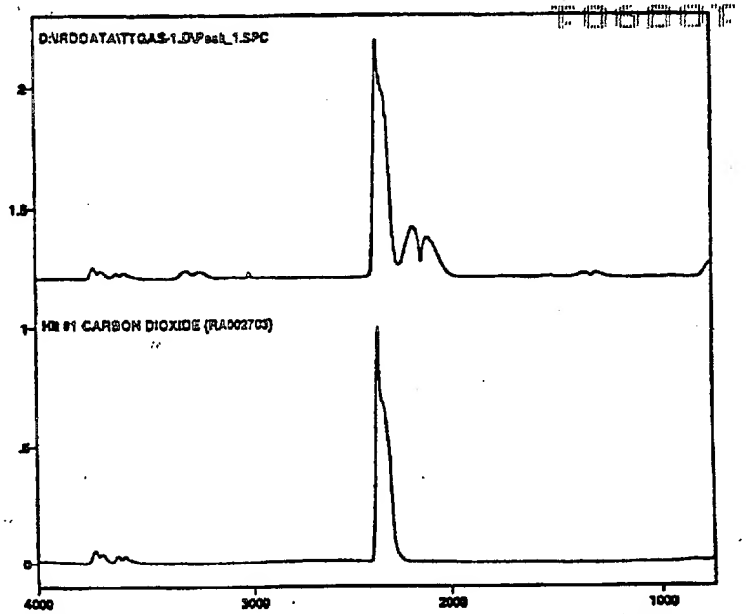

Figure 8.17. The independent confirmation at the PCFL of the NTS finding of Fig. 8.10 regarding the mutated IR signature of the CO_2 in magnegas. Note the identical shapes of the mutated IR peak in the top of the above figure, and that in Fig. 8.10 obtained via a different instrument. Note also the appearance again of two new peaks in the IR signature of CO_2, which indicate the presence of *new internal bonds* not present in the *conventional* molecule. Note finally that the instrument now correctly identifies the signature as that of the CO_2.

atomic weight smaller than 40 a.m.u., thus outside the range of the considered scans.

As indicated earlier, the presence of dimers and individual atoms in magnegas is essential for a quantitative interpretation of the large excess

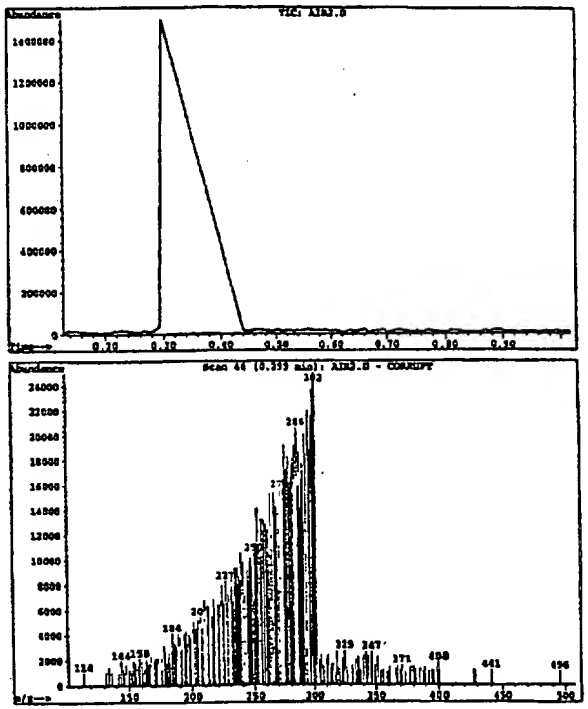

Figure 8.18. The first direct experimental verification at PCFL of the anomalous adhesion of magnecules. The figure reproduces the background of the instrument upon completion of the measurements, removal of magnegas, and conventional flushing. As one can see, the background results in being very similar to the MS scan during the tests, thus establishing that part of the gas had remained in the interior of the instrument. This behavior can only be explained via the induced magnetic polarization of the atoms in the walls of the instrument, with consequential adhesion of magnecules. It should be noted that this anomalous adhesion has been confirmed by all subsequent tests for both the gaseous and liquid states. The removal of magnecules in the instrument after tests required flushing with an inert gas at high temperature.

of energy contained in this new fuel, the order of at least three times the value predicted by quantum chemistry, which energy is released during combustion. The admission of dimers and atoms as constituents of magnecules readily explains this anomalous energy content because

said dimers and atoms are released at the time of the combustion, thus being able at that time to form molecules with exothermic reactions of type (8.5). In the event magnecules would not contain dimers and atoms, their only possible constituents are conventional molecules, in which case no excess energy is possible during combustion.

The large differences of MS peaks in the two tests at NTS and at PCFL of exactly the same gas in exactly the same range from 40 to 500 a.m.u., even though done with different GC-MS/IRD equipment, illustrates the importance of having a ramp time of the order of 26 minutes. In fact, sixteen different peaks appear in the MS scan following a ramp time of 26 minutes, as illustrated by Fig. 8.7, while all these peaks collapsed into one single peak in the MS scan of Figs. 8.13 and 8.14, because the latter were done with a ramp time of about 1 minute. Therefore, *the collapse of the sixteen peaks of Fig. 8.7 into the single large peak of Figs. 8.13 and 8.14 is not a feature of magnecules, but rather it is due to the insufficient ramp time of the instrument.*

9.5. Concluding Remarks

The tests on magnegas conducted at the *McClellan Air Force Base* and at *Pinellas County Forensic Laboratory*, as per representative scans of Figs. 8.7 to 8.18, constitute two independent verifications of all characteristics of gas magnecules according to Definition 8.2.1 which can be detected via GC-MS equipped with IRD, the remaining characteristics requiring separate measurements presented in the next section.

The first and perhaps most important evidence achieved for the first time in these tests is that *the scans of Figs. 8.7, 8.13 and 8.14 constitute independent experimental evidence of the new chemical species of magnecules in the terminology of Sect. 8.1 because they constitute not only an essentially pure, but actually a pure population of magnecules due to the complete absence of molecules in a directly detectable percentage.*

More generally, said independent tests, plus numerous additional tests not reported here for brevity, confirm the following features of Definition 8.2.1:

I) Magnecules have been detected in MS scans at high atomic weights where no molecules are expected for the gas considered. In fact, the biggest molecule in macroscopic percentages of the magnegas tested, that produced from tap water with conventional chemical composition (8.20), is CO_2 with 44 a.m.u., while peaks in macroscopic percentages have been detected with *ten times* such an atomic weight and more.

II) The MS peaks characterizing magnecules remain unidentified following a computer search among all known molecules. This feature has been independently verified for *each* of the sixteen peaks of Fig. 8.7, for

all peaks of Figs. 8.13 and 8.14, as partially illustrated in Figs. 8.8 and 8.15, as well as for all additional MS scans not reported here for brevity.

III) The above MS peaks characterizing magnecules admit no IR signature, thus confirming that they do not have a valence bond. In fact, none of the peaks here considered had any IR signature as partially illustrated in Figs. 8.9 and 8.16, thus confirming the achievement of an essentially pure population of magnecules.

IV) The IR signature of the only molecule detected in macroscopic percentage, that of the CO_2, is mutated precisely with the appearance of two additional peaks, as shown in Fig. 8.10 and independently confirmed in Fig. 8.17. Since any peak in the IR signature represents an internal bond, the mutation here considered confirms the creation by the PlasmaArcFlow technology of new internal magnetic bonds within conventional molecules, as per Fig. 8.6.

V) The anomalous adhesion of magnecules is confirmed in both tests from the evidence that the background (blank) at the end of the tests following conventional flushing continued to show the presence of essentially the same magnecules detected during the tests, as illustrated in Figs. 8.12 and 8.18.

VI) The atomic weight of magnecules mutates in time because magnecules can break down into fragments due to collisions, and then form new magnecules with other fragments. This feature is clearly illustrated by the macroscopic differences of the two scans of Figs. 8.13 and 8.14 via the same instrument on the same gas under the same conditions, only taken 30 minutes apart.

VII) Magnecules can accrue or lose individual atoms, dimers or molecules. This additional feature is proved in the scans of Figs. 8.13 and 8.14 in which one can see that: the peak at 286 a.m.u. of the former becoming 287 a.m.u. in the latter, thus establishing the accretion of one hydrogen atom; the peak at 302 a.m.u. in the former becomes 319 a.m.u. in the latter, thus establishing the accretion of the H–O dimer; the peak at 328 a.m.u. in the former becomes 334 a.m.u. in the latter, thus establishing the accretion of one O_2 molecule; the peak at 299 a.m.u. in the former become 297 a.m.u. in the latter, thus exhibiting the loss of one H_2 molecule; *etc.* It should be indicated that these features have been confirmed by all subsequent GC-MS/IRD scans not reported here for brevity.

The other features of Definition 8.2.1 require measurements other than those via GC-MS/IRD and, as such, they will be discussed in the next section.

Notice, as illustrated in Figs. 4.5 and 8.3, that there is no need for a total magnetic polarity in the clusters composing magnegas. As a matter

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of fact, its absence is necessary to avoid the inconsistent prediction that all clusters are paramagnetic. The general expectation that a cluster can have a magnetic moment if and only if exhibited by the cluster as a whole is, perhaps, a reason for the lack of prediction and detection of magnecules until now.

Similarly, ionic clusters must be excluded for any credible interpretation of the peaks of Figs. 8.7 to 8.18 due to the fact that ions have the same charge and, therefore, they repel, rather than attract each other.

Since the experimental evidence eliminates the possible valence or electric origin of the bond, the sole remaining possibility is that the attractive force responsible for the peaks is of magnetic character, namely, that said peaks constitute magnecules.

In closing the author would like to stress that the above findings, even though independently confirmed numerous times, should be considered preliminary and in need of additional independent verifications, which are here solicited under the suggestion that:

1) Only peaks with macroscopic percentages should be initially considered to avoid shifting issues of primary relevance into other of comparatively marginal importance at this time;

2) The internal *attractive* force necessary for the very existence of cluster is identified in clear numerical terms without vague nomenclatures deprived of an actual physical reality, or prohibited by physical laws; and

3) The adopted terminology is identified with care. The word "magnecule" is a mere name intended to denote a chemical species possessing the specifically identified characteristics I) to XV) of Definition 8.2.1 which are distinctly different than the corresponding characteristics of molecules. Therefore, the new species can not be correctly called molecules. The important features are these distinctly new characteristics, and not the name selected for their unified referral.

10. Experimental Evidence of Liquid Magnecules

10.1. Preparation of Liquid Magnecules used in the Tests

In early 1998 Santilli [1] obtained a number of samples of *fragrance oils* from *Givaudan-Roure Corporation* (GR) with headquarters in Teaneck, New Jersey. About 50 cc of various samples of perfectly transparent fragrance oils were placed in individual glass containers. One polarity of an alnico permanent magnet with 12,000 G and dimension $1/2'' \times 1'' \times 2''$ was immersed within said oils.

Starting with a perfect transparency, after a few days a darkening of the oils became visible, jointly with a visible increase of the viscosity, with changes evidently varying from oil to oil. Subsequently, there was the appearance of granules of dark complexes in the interior of the oil which were visible to the naked eye. Both the darkening and the viscosity increased progressively in subsequent days, to reach in certain cases a dark brown color completely opaque to light. The viscosity increased to such an extent that the oil lost all its fluidity.

It should be stressed that the above visible effects are of pure magnetic origin because of the lack of any other contribution, *e.g.*, the complete absence of any additives. After the immersion of the permanent magnets, all samples were left undisturbed at ordinary room conditions. The indicated effects remain unchanged to this day, thus showing that the changes were stable at ordinary conditions of temperature and pressure.

Santilli's [1] main hypothesis on the darkening of the oils is that their molecules acquire a magnetic polarization in the orbits of at least some of their atomic electrons (called in chemistry *cyclotron resonance orbits*), by therefore bonding to each other according to Definition 8.2.1 in a way similar to the corresponding occurrence for gases.

It should also be indicate that the immersion of one polarity of a permanent magnet in fragrance oils is, evidently, a rudimentary way to create magnecules in detectable percentage although not an essentially pure population of magnecules as requested for a new chemical species (see Sect. 8.1). A number of more sophisticated magnetic polarization techniques are now available with rather complex geometries. Also, as indicated in Sect. 8.5, an essentially pure population of liquid magnecules can be reached via the PlasmaArcFlow reactors described in the preceding chapter.

10.2. Photographic Evidence of Magnecules in Liquids

The above alteration of the structure of fragrance oils was confirmed by photographs taken by the GR Research Laboratory in Dubendorf, Switzerland, via a microscope with minimal magnification, as illustrated in the pictures of Figs. 8.19 and 8.20.

The pictures of Fig. 8.19 refer to the GR fragrance oil received under the code "ING258AIN, Text 2" subjected to the rudimentary magnetic polarization indicated in the preceding section under the respective magnification 10X and 100X.

As one can see, these photographs establish that, under the indicated magnetic treatment, the oil has acquired a structure of the type of "brick layering" which is visible under only 10X magnification, and is per se

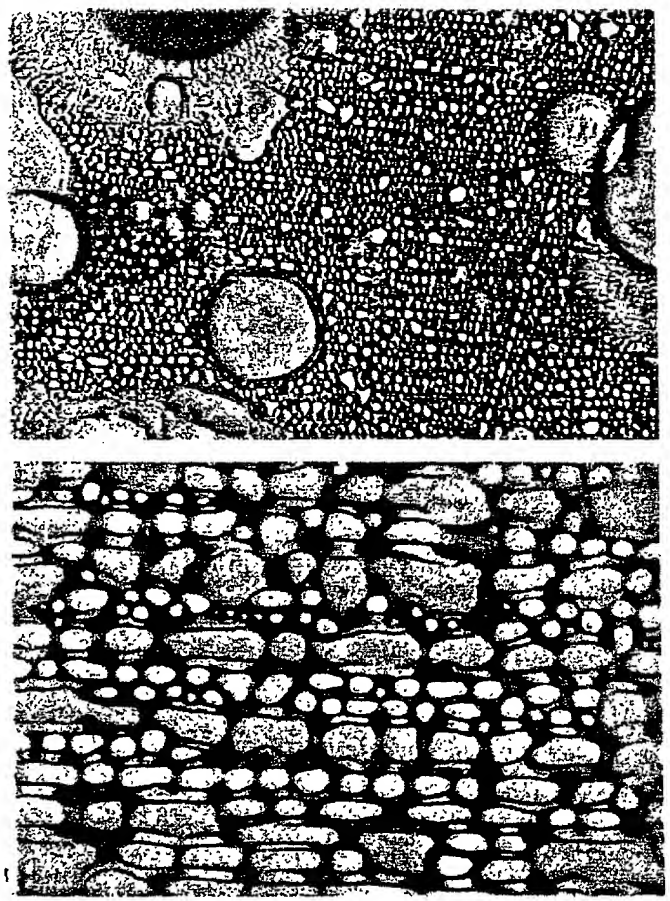

Figure 8.19. A photographic evidence of magnecules in liquids obtained at the *Givaudan-Roure Research Laboratory* in Dubendorf, Switzerland, in the GR fragrance oil "ING258IN Test 2" under magnifications 10X and 100X [1].

highly anomalous for a liquid that was originally fully transparent. Note that the magnecules are not constituted by the individual "bricks," but rather by the dark substance which interlock said "bricks." This point

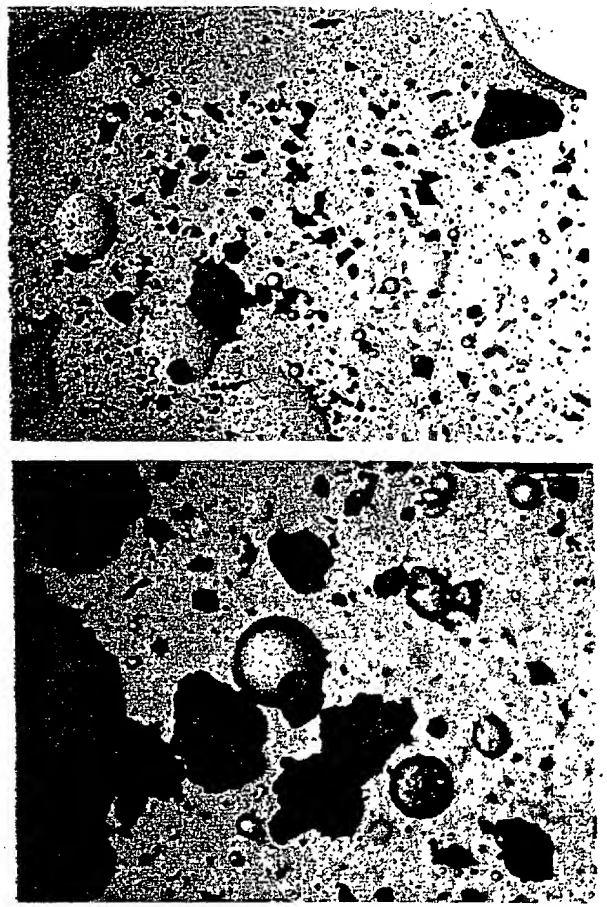

Figure 8.20. Confirmation of magnecules in GR fragrance oil "Mixture 2" under 10X and 100X obtained at the University of South Florida in St. Petersburg. Note the difference in sizes of the magnecules and their difference with those of Fig. 8.19 [1].

is important to understand the size of the magnecule here considered which covers the entire 50 cc of the liquid.

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The photographs in Figs. 8.20 were taken at the University of South Florida in St. Petersburg via a microscope with the same magnifications 10X and 100X, but refer to a different GR fragrance oil received under the code "Mixture 2" and magnetically treated to such a point of completely losing transparency and fluidity. As one can see, the latter picture provides confirmation that, following exposure to a 12,000 G magnetic field, fragrance oil molecules bond together into rather large clusters estimated to be well in excess of 10,000 a.m.u., that is, with an atomic weight which is dramatically bigger than that of the largest molecule composing the oil, as per Feature I) of Definition 8.2.1.

Inspection of the various photographs shows a variety of sizes of magnecules, thus establishing their lack of unique characteristics for any given liquid. This evidently confirms the *lack* of a valence bond. Inspection of the samples also show the magnecules capability of increasing their size via the accretion of further oil molecules.

Other photographic documentations of various magnecules in liquids were done, by confirming the findings of Figs. 8.19 and 8.20.

10.3. Spectroscopic Evidence of Liquid Magnecules at the Tekmar-Dohrmann Corporation

The first experimental evidence of magnecules in liquids was established on May 5, 1998, by analysts *Brian Wallace* and *Mia Burnett* at *Tekmar-Dohrmann Corporation* (TDC) in Cincinnati, Ohio, operating a *Tekmar 7000 HT Static Headspacer Autosampler* equipped with a Flame Ionization Detector (FID). The tests were repeated on May 8 and 11, 1998, by confirming the preceding results. It should be noted that the Tekmar equipment lacks the computer search as well as the UV scan. Also, the instrument had limited capability in atomic weight. Finally, the FID was permitted in this case because the liquids were not combustible.

The measurements were done on: Sample 1, pure (magnetically untreated) GR "Fragrance Oil 2"; Sample 2, magnetically untreated tap water; and Sample 3, a magnetically treated mixture of the two.

Despite these limitations, *the results of the Tekmar tests provided the first direct spectroscopic evidence of the existence of magnecules in liquids, including the first direct experimental evidence of water magneplexes* as per Definition 8.2.1. In particular, these tests established that magnecules in liquids have the same main features of the magnecules in gases.

To avoid a prohibitive length we reproduce only a few representative scans in Figs. 8.21 to 8.25 [1]. Figure 8.21 reproduces the origin test of

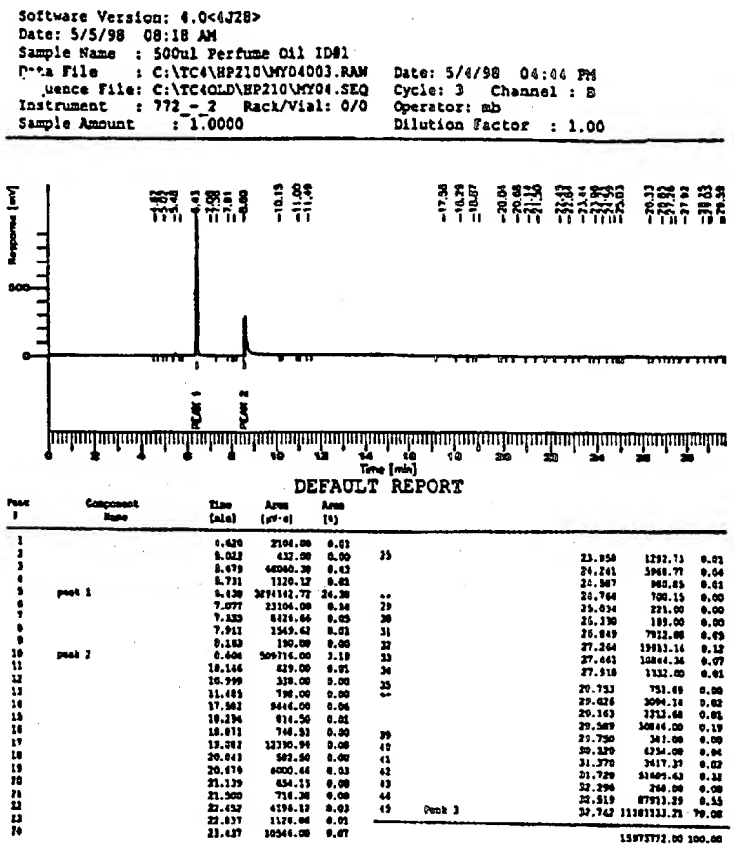

Figure 8.21. A first scan done on May 5, 1998, 8.18 a.m. at *Tekmar Dohrmann Company* (TDC) in Cincinnati, Ohio, via a Tekmar 7000 HT Static Headspacer Autosampler with a Flame Ionization Detector (FID).

the fragrance oil without magnetic treatment. Note the dominance of three molecules denoted "Peak 1" with 24.28%, "Peak 2" with 3.19% and "Peak 3" with 70.00%. Figure 8.22 depicts the background which is shown to be correct. Figure 8.23 represent the scan of magnetically treated water with a large "unknown 1" with 64.24% and "unknown 2" with 33.53% totaling 97.78%. This is evidence of the creation of mag-

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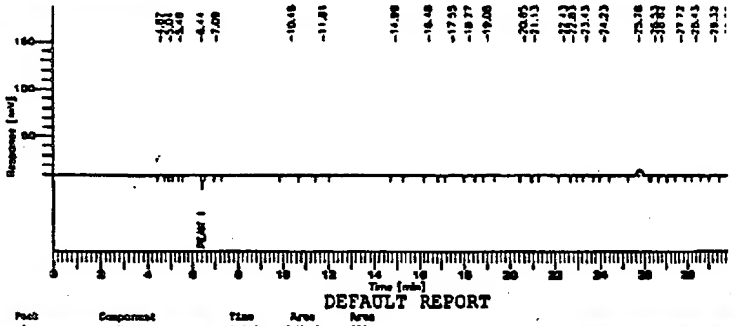
Software Version: 4.0<4J28>
Date: 5/5/98 08:19 AM
Sample Name : Blank vial
Data File : C:\TC4\HP210\MY04004.RAW Date: 5/4/98 05:25 PM
uence File: C:\TC4OLD\HP210\MY04.SEQ Cycle: 4 Channel : B
...strument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



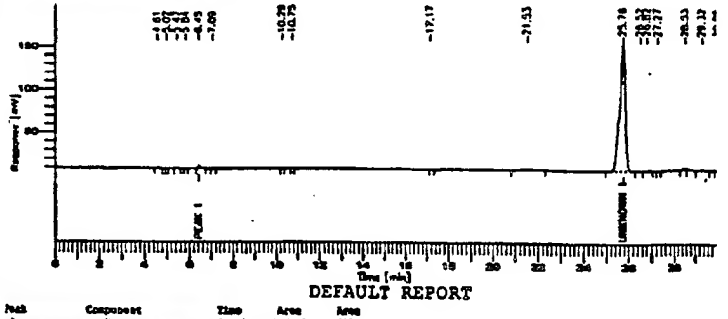
DEFAULT REPORT

Peak #	Component Name	Time [min]	Area [uV*s]	Area [%]
1		4.620	2225.00	0.14
2		5.035	283.30	0.02
3		5.463	646.00	0.04
4	peak 3	6.435	1182.00	0.07
5		7.090	693.50	0.03
6		10.663	1636.00	0.10
7		11.807	1495.00	0.09
8		14.989	790.00	0.05
9		16.482	1093.00	0.06
10		17.547	9839.69	0.61
11		18.278	932.30	0.06
12		19.076	7533.00	0.47
13		20.653	4130.00	0.26
14		21.133	670.50	0.04
15		22.436	5150.00	0.32
16		22.828	983.50	0.06
17		23.629	10294.00	0.64
18		24.279	5969.00	0.37
19		25.777	93366.00	5.82
20		26.530	3279.19	0.14
21		26.823	3216.01	0.20
22		27.726	937.00	0.05
23		28.426	4520.00	0.28
24		29.321	7283.42	0.39
25		30.017	7163.53	0.44
		30.302	6186.45	0.39
		31.454	1421171.00	88.50
	Peak 3	32.674	1842.00	0.11
			1605763.00	100.00

Figure 8.22. The scan at TDC on 5/5/98 at 8.19 a.m. to check that the background is correct.

necules in water, also called magneplexes according to Definition 8.2.1. Figure 8.24 represents a scan of the magnetically treated combination of water and fragrance oil with "unknown 1" 1.75% and "unknown 2"

Software Version: 4.0<4J28>
Date: 5/5/98 08:20 AM
Sample Name : 500ml H2O ID#2
Data File : C:\TC4\HP210\MY04005.RAW Date: 5/4/98 06:06 PM
uence File: C:\TC4OLD\HP210\MY04.SEQ Cycle: 5 Channel : B
...strument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



DEFAULT REPORT

Peak #	Component Name	Time [min]	Area [uV*s]	Area [%]
1		4.434	2904.00	0.07
2		5.026	373.30	0.01
3		5.469	1228.00	0.03
4		5.848	322.00	0.01
5	peak 3	6.446	17310.50	0.43
6		7.098	390.00	0.01
7		10.788	164.00	0.00
8		12.716	195.00	0.00
9		17.171	970.30	0.02
10		21.527	21536.00	0.61
11	unknown 1	23.763	2563446.71	64.24
12		24.523	2794.13	0.07
13		26.121	5154.44	0.08
14		27.371	184.00	0.00
15		28.534	1914.50	0.10
16		29.315	9941.00	0.25
17		30.048	1862.00	0.03
18		30.981	1916.00	0.05
19	unknown 2	31.683	1339095.00	33.53
20	Peak 3	32.680	9931.00	0.25
			3991184.00	100.00

Figure 8.23. The scan at TDC on 5/5/98 at 8.19 a.m. on the magnetically treated water which constitutes experimental evidence of magnecules in water given by the large unknown peak.

with 0.45%. An important information of this scan is that the original Peak 1 of Fig. 8.21 with 24.28% and Peak 3 with 70.00% have been decreased to the values 5.33% and 68.71%, respectively. This is evidence that the missing percentages of these molecules have been used in the formation of magnecules. Figure 8.25 reproduces the background following the tests and routine flushing. As one can see, the scan pre-

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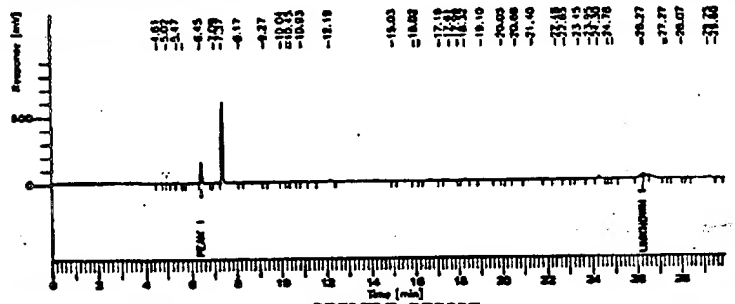
Software Version: 4.0<4J28>
Date: 5/5/98 08:21 AM
Sample Name : 500ul Oil&H2O ID#3
Data File : C:\TC4\HP210\MY04009.RAM Date: 5/4/98 08:50 PM
Sequence File: C:\TC4OLD\HP210\MY04.SEQ Cycle: 9 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



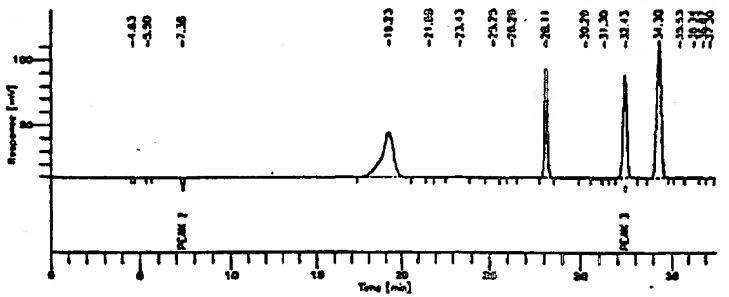
DEFAULT REPORT

Peak #	Component Name	Time [min]	Area [uV*s]	Area [%]
1		4.612	3968.00	0.02
2		5.071	682.50	0.00
3		5.466	16416.00	0.11
4		5.715	302.00	0.00
5	peak 1	6.449	700997.00	5.33
6		7.085	17702.00	0.13
7		7.373	2403431.75	18.76
8		8.174	1041.35	0.01
9		9.273	398.50	0.00
10		16.038	693.50	0.01
11		16.297	407.50	0.00
12		16.456	32776.91	0.25
13		16.932	653.00	0.00
14		17.183	45046.00	0.34
15		17.529	735.50	0.01
16		16.978	363.50	0.00
17		18.213	299.50	0.00
18		17.163	485.13	0.00
19		17.657	9128.75	0.06
20		17.989	250.64	0.00
21		18.323	773.50	0.01
22		19.101	7936.00	0.06
23		20.038	1511.00	0.01
24		20.684	3329.49	0.03
25		21.903	6940.01	0.05
26		22.477	3617.00	0.03
27		22.848	1395.00	0.01
28		23.455	8746.50	0.07
29		23.945	1371.77	0.04
30		24.296	89749.23	0.68
31		24.779	1229.50	0.01
32		24.964	2011.50	0.02
33	unknown 1	25.277	229844.61	1.75
34		25.547	142911.29	1.16
35		27.273	23096.00	0.18
		27.419	13011.00	0.10
		28.070	324.00	0.00
		29.256	52774.58	0.40
38		29.599	15904.00	0.13
39		30.345	65596.75	0.50
41		30.888	2408.67	0.02
42		31.387	6178.93	0.05
43	unknown 2	31.491	59456.97	0.45
44		32.008	666.00	0.01
45		32.526	64277.94	0.49
46	Peak 3	32.758	9034646.86	68.71
			13148342.60	100.00

Figure 8.24. The scan on 5/5/98 at 8.21 a.m. on the magnetically treated mixture of water and fragrance oil of scan 8.21 which constitutes evidence of magnecules given by two unknown peaks.

serves macroscopic percentages of the preceding scans, thus confirming the anomalous adhesion also existing in gas magnecules.

Software Version: 4.0<4J28>
Date: 5/5/98 02:06 PM
Sample Name : Blank
Data File : C:\TC4\HP210\MY05001.RAW Date: 5/5/98 09:08 AM
Sequence File: C:\TC4OLD\HP210\MY05.SEQ Cycle: 1 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



DEFAULT REPORT

Peak #	Component Name	Time [min]	Area [uV*s]	Area [%]
1		4.833	2631.00	0.05
2		5.496	695.50	0.01
3	peak 2	7.379	293.00	0.01
4		19.227	1795761.00	33.57
5		21.679	1071.00	0.02
6		23.632	18393.00	0.34
7		25.247	6824.50	0.13
8		26.290	2393.00	0.04
9		28.110	835986.00	15.63
10		30.291	12877.00	0.24
11		31.296	1438.00	0.03
12	Peak 3	32.425	1135236.38	21.22
13		34.296	1506402.50	28.29
14		35.532	6202.50	0.12
15		36.364	9033.76	0.17
16		36.866	1934.19	0.04
17		37.297	7085.45	0.13
18		37.914	3731.10	0.05
			5349096.00	100.00

Figure 8.25. The scan at TDC on 5/5/98 at 2.26 p.m. on the background with anomalous adhesion confirming the corresponding anomalous background for gas magnecules.

10.4. Spectroscopic Evidence of Liquid Magnecules at Florida International University

Additional comprehensive tests via a modern equipment for LC-MS equipped with UVD were conducted on the GR fragrance oil "ING258IN Test 2" of Figs. 8.19 on December 1, 1998, at the chemistry laboratory of *Florida International University* (FIU) in Miami, Florida. The tests

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were then repeated on December 17 and 18 by confirming the preceding results.

The tests were conducted under a number of technical characterizations specifically selected to detect magnecules, among which include:

1) Total Ion Chromatogram (TIC) collected under the positive ion atmospheric pressure electrospray ionization (ESI+) mode;

2) Integrated TIC with retention times and areas for the most abundant peaks;

3) Raw mass spectra for all peaks identified in item 2;

4) HP LC chromatograms collected at fixed wavelength of 254 cm; and

5) UV-visible spectra form the HPLC diode array detector with 230–700 mm.

The tests were conducted on the following samples:

I) Sample GR331, the magnetically untreated, fully transparent GR fragrance oil "ING258IN Test 2";

II) Sample GR332, magnetically treated "ING258IN Test 2" with 10% Dipropylene Glycol (DPG);

III) Sample GR332S, bottom layer of the preceding sample;

IV) Sample GR335, magnetically treated mixture 4% GR fragrance oil "ING258IN Test 2", 0.4% DPG and 95% tap water; and

V) Sample GR335O, visible dark clusters in the preceding sample.

To avoid a prohibitive length of this presentation, only representative scans are reproduced in Figs. 8.26 to 8.30 [1]. As one can see, these scans provide a second experimental evidence of magnecules in liquids as evident in comparing the peaks of the untreated liquid with those of the treated one.

A few comments are in order. To understand the FIU measurements the reader should keep in mind that the liquid is that of Fig. 8.18. Consequently, *the magnecules to be tested are visible to the naked eye. Therefore, only minute fragments entered the capillary feeding lines of the LC-MS/UVD instrument.*

Finally, the reader should keep in mind that the magnetic polarization of the test has been minimal, and *the liquid does not constitute a pure population of liquid magnecules.* The latter case is available from the PlasmaArcFlow reactors of Chapter 7 whose study is here omitted.

11. Experimental Verification of Mutated Physical Characteristics

In addition to the preceding *chemical* features, the existence of magnecules implies the mutation of *physical* characteristics, such as increase of the specific density and viscosity. This is due to the fact that magnetic

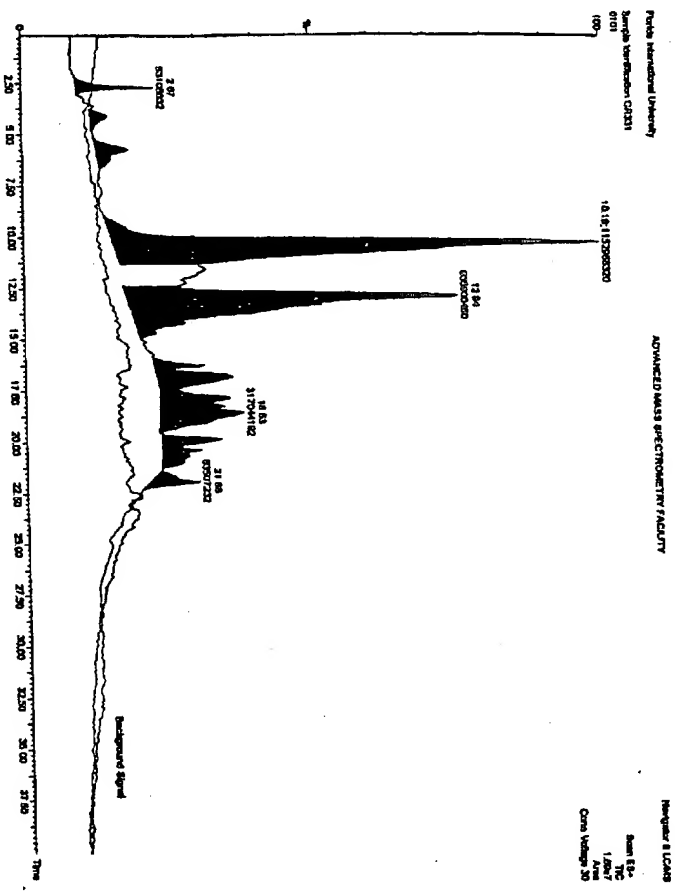

Figure 8.26. Scan on the untreated GR oil "ING258IN Test 2" of Fig. 8.18 (GR331 of the text) conducted at *Florida International University* (FIU).

bonds among ordinary molecules imply an evident reduction of intermolecular distances, thus resulting in more molecules per unit volume, as compared to the magnetically untreated substance. The increases in density and viscosity are then consequential.

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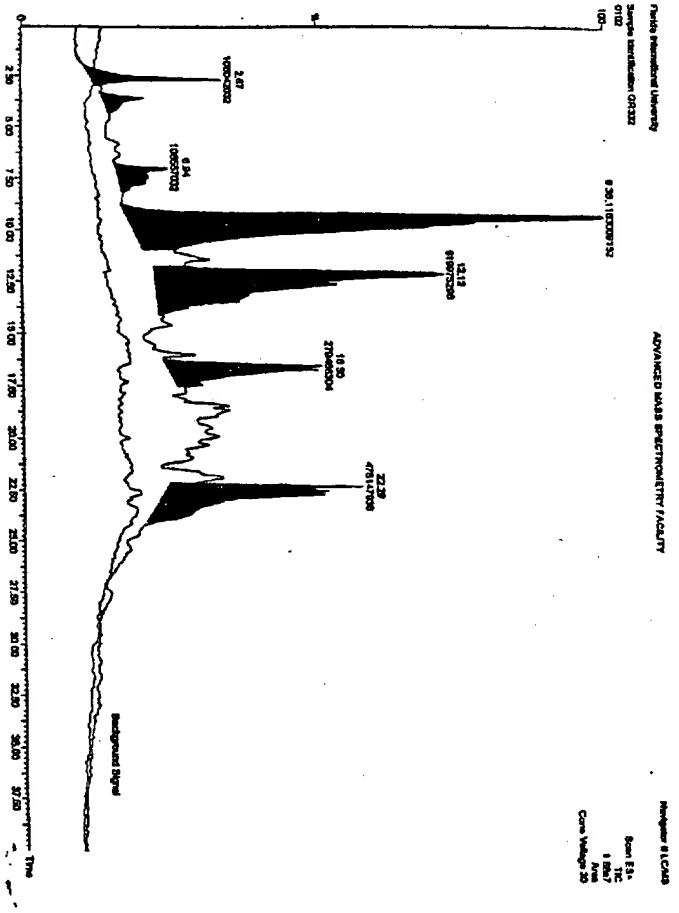

Figure 8.27. Scan at FIU of Sample GR332.

A most intriguing feature of gas magnecules with important scientific and industrial implications is that *the Avogadro number of a gas with magnecular structure is not constant, or, equivalently, the so-called "gas constant" R of a gas with magnecular structure is an (expectedly non-linear) function of P, V, T, $R = R(P,V,T)$*, resulting in the generalized

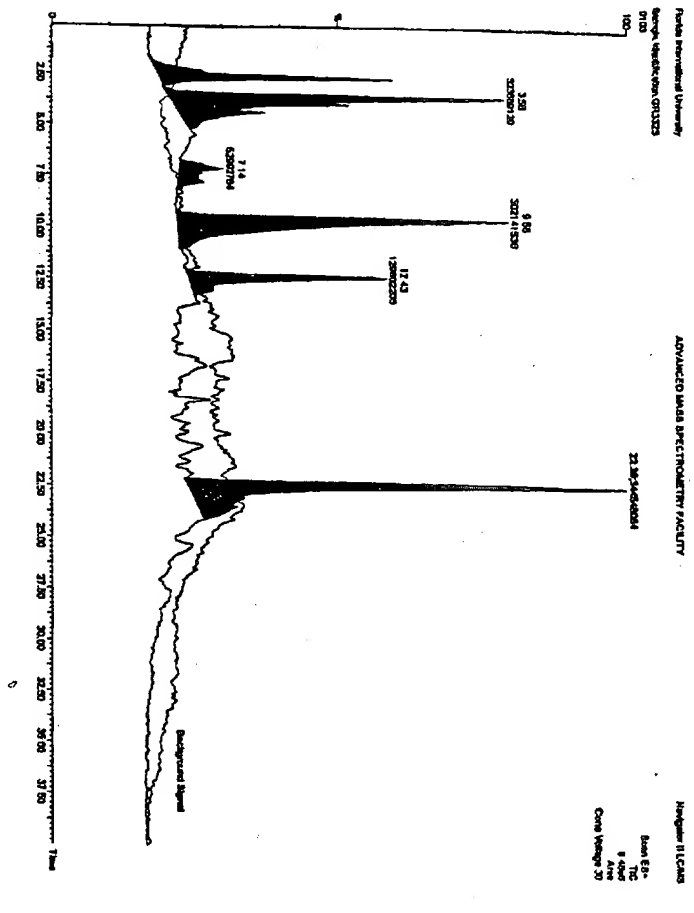

Figure 8.28. Scan at FIU of Sample GR332S.

gas law

$$\frac{PV}{T} = nR(P,V,T), \tag{8.21}$$

where the explicit dependence of R on P, V, and T depends on the magnecular gas considered.

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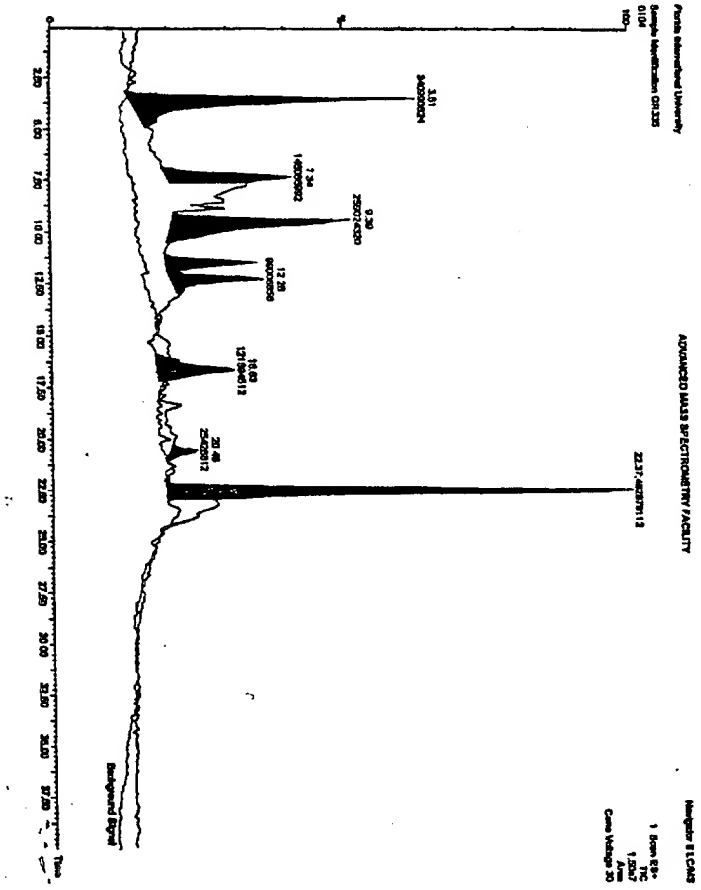

Figure 8.29. Scan at FIU of Sample GR335.

The variation of the Avogadro number for gas with magnecular structure has been proved by routine tests at *USMagnegas, Inc.*, Largo, Florida, establishing that:

1) The number of constituents of a gas with magnecular structure decreases with a sufficient increase of the pressure;

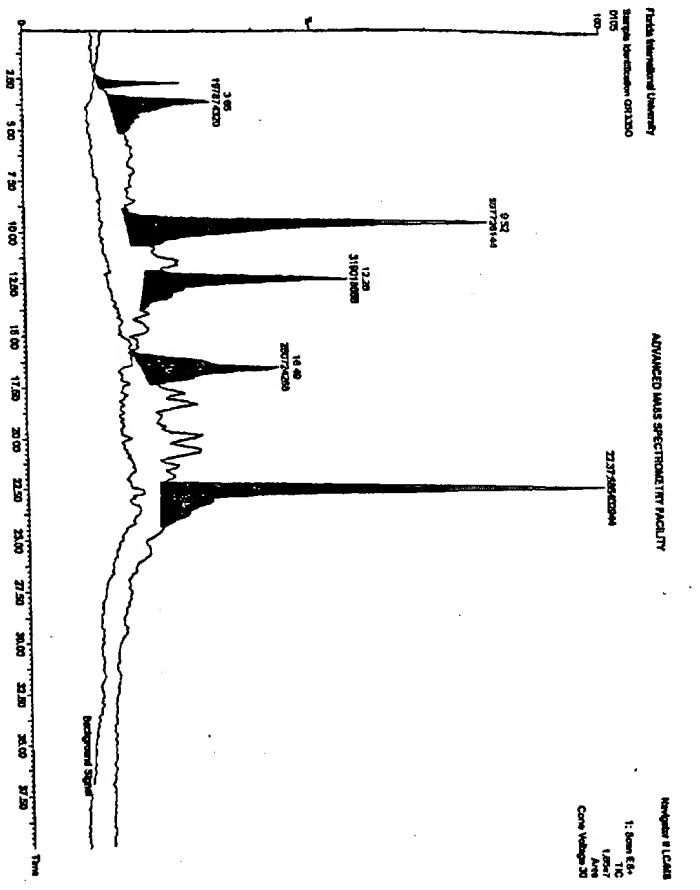

Figure 8.30. Scan at FIU of Sample GR335O.

2) Given a fixed and sealed tank with volume V of a gas with magnecular structure at given pressure P and temperature T, after bringing this tank to a sufficiently higher temperature $T' > T$, and then returning it to the original temperature T, the pressure of the tank is not the original pressure P but a generally bigger pressure $P' > P$;

3) The increase of pressure of a gas with magnecular structure requires a volume which generally increases with the pressure itself, that is, if the increase of pressure in a given tank from 100 psi to 200 psi requires V cf of magnecular gas, the same increase of pressure in the same tank via the same gas, this time from 4,000 psi to 4,100 psi at the same temperature does not require the same volume V but a volume V' of the magnecular gas bigger than the original volume, $V' > V$.

The above deviations from the conventional gas law are easily explained by the fact that *the increase of pressure in a gas with magnecular structure generally implies the aggregation of magnecules into bigger clusters, with consequential decrease of the number of constituents.* Similarly, *the increase of temperature generally implies the breaking down of magnecules into smaller clusters, with consequential increase of the number of constituents and resulting anomalous increase of pressure.* It then follows that, if the increase of temperature of a given fixed volume is beyond the Curie Magnecular Point (Definition 8.2.1), all magnetic polarizations are terminated with consequential increase of the number of constituents due to the reduction of magnecules to molecules. This implies that the return of the gas to the original temperature does not restore the original magnecules, and, consequently, the return to the original temperature generally occurs at an increased pressure due to the increased number of constituents.

We now report measurements of specific density, viscosity and other characteristics of fluids with magnecular structure which confirm the above GC-MS/IRD and LC-MS/UVD tests, by providing final evidence on the existence of magnecules as per Definition 8.2.1.

All tests were done via the use of ordinary tap water and a number of GR fragrance oils. All samples here considered were prepared by conventionally mixing tap water and one fragrant oil, and then submitting that mixture to rather weak permanent magnets of 200 G (much weaker than those used for the fragrance oils of Figs. 8.18 and 8.19). All samples resulted in being very stable without any measurable change over a period of about one year, and survived freezing followed by defrosting. The various samples were numbered from 1 to 25.

The measurements of the specific density were conducted on March 9, 1998 by the *U.S. Testing Company, Inc.* (USTC) of Fairfield, New Jersey. The results of the tests are presented in Figs. 8.31 and 8.32.

Sample 1 is ordinary untreated tap water. Sample 2 is ordinary tap water magnetically treated for about 5 minutes. Samples 3 and 4 were tap water treated with other magnetic equipment. Sample 5 was ordinary untreated GR fragrance oil "APC Fragrance." Sample 6 was a mixture of fragrance oil 5 with tap water magnetically treated for about

EXHIBIT " SET 00006

REPORT OF TEST

SGS U.S. Testing Company Inc.
291 Fairfield Avenue
Fairfield, NJ 07004-3833
Tel: 973-575-5252
Fax: 973-244-1694

Report Number: 103947
Date: 03/09/98
Page: 1 of 1

Millennium Results

Density of	g/mL	% Change Density vs Ordinary Water
Sample #1	0.9805	0
Sample #2	0.9839	+0.36
Sample #3	0.9804	0
Sample #4	0.9853	+0.49
Fragrant #5	0.9720	NA
Mixture #6	0.9967	+1.65
Mixture #7	0.9982	+1.80
Mixture #8	0.9902	0.99
Treated Water #16	0.9893	0.89
Frag Treated # 17	0.9453	NA
Mixture #18	0.9902	0.99
Mixture #19	0.9929	1.28

Samples were transferred to a separatory funnel. The layers were allowed to separate. The water layer was withdrawn into a funnel with Whatman #4 filter paper. The filtrate was transferred to a preweighed 10 mL volumetric flask. The sample was weighed to 0.0001 grams and the density calculated.

When the samples were pure substances, they were transferred directly to preweighed 10 mL volumetric flasks.

Calculations:

Weight flask with sample - weight flask ÷ volume of flask = g/mL

Arlyn Sibille, Ph.D.

Figure 8.31. USTC measurements of specific density on magnetically treated liquids.

REPORT OF TEST

T06007 S21900005

SGS U.S. Testing Company Inc.
291 Fairfield Avenue
Fairfield, NJ 07004-3833
Tel: 973-575-5252
Fax: 973-244-1694

Report Number: 103947
Date: 03/09/98
Page: 1 of 1

SUBJECT: Three (3) samples received on 02/09/98 and identified by the client as:

PURPOSE: Determine the density and viscosity of the three samples.

TEST DATE: 02/25/98

PROCEDURE: Three 10 milliliter volumetric flasks were pre-weighed. One of the samples was transferred to each of the volumetric flasks with a pipet. The samples were weighed again. The density of each sample was calculated.

The three oil samples were measured for viscosity using a Kinematic viscometer (ASTM D-445).

RESULTS:

Sample Identification	Density, g/mL)	Viscosity (cps)	Increase Viscosity, %
1) Motor Oil, "as is"	0.8682	199.8	0
2) Motor Oil, Treatment Type A	0.8714	288.7	44.5
3) Motor Oil, Treatment Type B	0.8689	302.0	51.2

SIGNED FOR THE COMPANY BY:

James R. Tyminski
Laboratory Supervisor

Arlyn Sibille, Ph.D.
Laboratory Director

/mo

Member of the SGS Group

Figure 8.32. USTC measurements of viscosity on magnetically treated liquids.

5 minutes. Mixtures 7 and 8 were the same mixture 5 although treated with other equipment. Sample 17 was a magnetically treated GR oil "Air Freshener 1." Mixture 19 was Fragrance 17 with tap water 16 magnetically treated for 5 minutes. Note that all measurements were done to an accuracy of the fourth digit. Therefore, numerical results up to the third digit can be considered accurate.

In the transition from Sample 1 (untreated water) to Sample 2 (magnetically treated water) there is an increase in the specific density in

the macroscopic amount of 0.86%, thus confirming the indicated mutation of the specific density of water under a magnetic treatment. In turn, the increase in density supports the existence of magneplexes in magnetically treated water as per the scan of Fig. 8.27.

As well known, fragrance oils are (generally) *lighter* than water, *i.e.*, the specific density of the untreated fragrance in Sample 5 is *smaller* than that of the untreated water in Sample 1. According to quantum chemistry, the specific density of any mixture of the above two liquids, whether solution, suspension or dispersion, should be *in between* the lighter and heavier specific densities.

On the contrary, as one can see, *the specific density of the magnetically treated mixture of GR fragrance with tap water, Sample 6, resulted in being bigger than that of the densest liquid, the water.* This measurement constitutes additional, rather strong, direct experimental verification of the mutation of physical characteristics in liquids under magnetic fields.

A remarkable point is that the *magnetic mutations of density are macroscopically large.* In fact, they were called by an analyst "UPS-type anomalies", meaning that the shipment via UPS of a given volume of a magnetically treated liquid may require an increase of the shipping cost of the same volume of untreated liquid due to the macroscopic increase in the weight.

A further prediction of magnetically polarized liquids is the increase of its viscosity. This is evidently due to the arbitrary size of an individual magnecule, as well as the tendency of the same to bond to near-by molecules, resulting in accretions, not to mention the anomalous adhesion to the walls of the container, which has been systematically detected for all magnetically polarized liquids.

As indicated earlier, in certain cases the increase of viscosity is so large as to be first visible to the naked eye, and, when the treatment is sufficiently protracted, the increase in viscosity is such as to lose the customary liquid mobility.

Ordinary engine oils are particularly suited for magnetic treatment because, when properly treated, their increase in viscosity is so dramatic as to be visible to the naked eye jointly with a visible change in visual appearance (color, texture, opacity, *etc.*).

The measurements on viscosity are reported in Fig. 8.32. The selected engine oil was an ordinarily available 30-40 Castrol Motor Oil subjected to a particular type of magnetic treatments via two different kinds of equipment called of Type A and B. All treatments were done at ordinary conditions without any additive or change of any type. As one can

see, *measurement 2 shows a dramatic increase in the viscosity in the magnetically treated oil of 44.5%.*

The above experimental results evidently provide additional support for the existence of magnecules.

The tests also provide evidence of the anomalous adhesion of liquids with magnecules, which is established in this case by a dramatic, macroscopic increase of adhesion of the oil to the walls of the glass container.

The same macroscopic anomaly is confirmed at the microscopic level. During the measurement of viscosity there was such an anomalous adhesion of the magnetically treated oils to the walls of the instrument that said oil could not be removed via routine cleaning with acetone and required the use of strong acids.

This anomalous adhesion is further experimental evidence of the existence of magnecules, because of their predicted capability to induce the polarization of the orbits of the valence electrons of the atoms in the walls of the container, thus resulting in anomalous adhesion via magnetic bonds due to induction.

It is evident that the mutations of density and viscosity implies the expected mutation of *all* other physical characteristics of the liquid considered. These measurements are left to the interested researchers.

The existence of mutation of *physical* characteristics then implies the mutation of *chemical* features. At this moment, we can only indicate the visual evidence reported by the analysts of USTC according to whom the reaction of magnetically treated oils with acetone is dramatically different from that with untreated oil, including mutations in color, texture and other appearances.

12. Concluding Remarks

The theoretical and experimental evidence presented in this Chapter establishes that the chemical species of molecules, defined as stable clusters of atoms under a valance bond, does not exhaust all possible chemical species existing in nature.

This conclusion is proved beyond scientific doubt, for instance, by macroscopic percentage of stable clusters, with atomic weight of several hundreds a.m.u., in light gases without an infrared signature where heaviest possible detected molecule is the CO_2 with 44 a.m.u.; the mutation of transparent oils into a completely opaque substance without fluidity; the joint increase of the specific density for both gaseous and liquid cases; and other evidence.

Needless to say, the final *characterization* and *detection* of the new chemical species submitted in Ref. [1] and reviewed in this chapter will require a considerable collegial effort, since the methods presented in this chapter are manifestly preliminary, with the understanding that, again, the *existence* of the new chemical species is outside scientific doubts.

As a matter of fact, the proposed new chemical species of magnecules, which, according to Definition 8.2.1 includes that of molecules, cannot be considered itself as the final chemical species in nature as it is the fate proved by history for all scientific discoveries.

As an example, the reformulation of magnecules via the hyperstructural branch of hadronic chemistry implies the prediction of the broader chemical species of *hypermagnecules* which is apparently more suitable to represent living organisms due to its inherent irreversibility, multidimensional structure compatible with our three-dimensional sensory perception, and other features needed for a more adequate representation of the complexities of living organisms. The *novelty* of this possible species is then an evident consequence of its novel features. Its *need* is established by the fact that current attempts to decipher the DNA code via the numbers used for molecules and magnecules dating back to biblical times have little chance of success, thus mandating the use of broader numbers, such as the hypernumbers and related multi-dimensional structures.

All in all, we can safely conclude that science is a discipline which will never admit final theories.

APPENDIX 8.A

Aringazin's Studies on Toroidal Orbits of the Hydrogen Atom under an External Magnetic Field

In the main text of this chapter we have presented the theoretical and experimental foundations of the new chemical species of magnecules which is centrally dependent on individual atoms acquiring a generally toroidal configuration of the orbits of at least the peripheral electrons when exposed to sufficiently intense external magnetic fields, as originally proposed by Santilli [1] and reviewed in the main text of this Chapter.

In this Appendix we outline the studies by Aringazin [8] on the Schrödinger equation of the hydrogen atom under a strong, external, static and uniform magnetic field which studies have confirmed the toroidal configuration of the electron orbits so crucial for the existence of the new chemical species of magnecules.

It should be stressed that when considered at orbital distances (i.e., of the order of 10^{-8} cm), atoms and molecules near the electric arc of hadronic reactors (Chapter 7), and in the plasma region, are exposed to a strong magnetic field, whose intensity may be high enough to cause the needed magnetic polarization (see Fig. 8.4.D).

A weak, external, static, and uniform magnetic field B causes an anomalous Zeeman splitting of the energy levels of the hydrogen atom, with ignorably small effects on the electron charge distribution. In the case of a more intense magnetic field which is strong enough to cause decoupling of a spin-orbital interaction (in atoms), $e\hbar B/2mc > \Delta E_{ls} \simeq 10^{-3}$ eV, i.e., for $B \simeq 10^5$ Gauss, a normal Zeeman effect is observed, again, with ignorably small deformation of the electron orbits.

More particularly, in the case of a *weak* external magnetic field B, one can ignore the quadratic term in the field B because its contribution is small in comparison with that of the other terms in Schrödinger equation, so that the *linear* approximation in the field B can be used. In such a linear approximation, the wave function of electron remains unperturbed, with the only effect being the well known Zeeman splitting of the energy levels of the H atom. In both Zeeman effects, the interaction energy of the electron with the the magnetic field is assumed to be much smaller than the binding energy of the hydrogen atom, $e\hbar B/2mc \ll me^4/2\hbar^2 = 13.6$ eV, i.e., the intensity of the magnetic field is much smaller than some characteristic value, $B \ll B_0 = 2.4 \cdot 10^9$ Gauss = 240000 Tesla (recall that 1 Tesla = 10^4 Gauss). Thus, the action of a weak magnetic field can be treated as a small perturbation of the hydrogen atom.

In the case of a *very strong* magnetic field, $B \gg B_0$, the quadratic term in the field B makes a great contribution and cannot be ignored. Calculations show that, in this case, a considerable deformation of the electron charge distribution in the hydrogen atom occurs. More specifically, under the influence of a very strong external magnetic field a magnetic confinement takes place, i.e., in the plane perpendicular to the direction of magnetic field (see Fig. 8.4.D), the electron dynamics is determined mainly by the action of the magnetic field, while the Coulomb interaction of the electron with the nucleus can be viewed as a small perturbation. This adiabatic approximation allows one to separate variables in the associated Schrödinger equation [9]. At the same time, in the direction of the magnetic field the motion of electron is governed both by the magnetic field and the Coulomb interaction of the electron with the nucleus.

The highest intensities of magnetic fields maintained macroscopically at large distances in modern magnet laboratories are of the order of $10^5 - 10^6$ Gauss (~ 50 Tesla), i.e., they are much below $B_0 = 2.4 \cdot 10^9$ Gauss ($\sim 10^5$ Tesla). Extremely intense external magnetic fields, $B \geq B_c = B_0/\alpha^2 = 4.4 \cdot 10^{13}$ Gauss, correspond to the interaction energy of the order of the mass of electron, $mc^2 = 0.5$ MeV, where $\alpha = e^2/\hbar c$ is the fine structure constant. In this case, despite the fact that the extremely strong magnetic field does characterize a stable vacuum in respect to creation of electron-positron pairs, one should account for relativistic and quantum electrodynamics (QED) effects, and invoke Dirac or Bethe-Salpeter equation. These contributions are of interest in astrophysics, for example, in studying the atmosphere of neutron stars and white dwarfs which are characterized by $B \simeq 10^9 \ldots 10^{13}$ Gauss.

Aringazin [8] has focused his studies on magnetic fields with intensities of the order of $2.4 \cdot 10^{10} \leq B \leq 2.4 \cdot 10^{13}$ Gauss, at which value nonrelativistic studies via the Schrödinger equation can be used to a very good accuracy, and the adiabatic approximations can be made.

Relativistic and QED effects (loop contributions), as well as effects related to finite mass, size, and magnetic moment of the nucleus, and the finite electromagnetic radius of electron, reveal themselves even at low magnetic field intensities, and can be accounted for as very small perturbations. Additional effects are related to the apparent deviation from QED of strongly correlated valence bonds as studies in Chapter 4. These effects are beyond the scope of the presented study, while being important for high precision studies, such as those on stringent tests of the Lamb shift.

It should be noted that locally high-intensity magnetic fields may arise in plasma as the result of nonlinear effects, which can lead to the creation of stable self-confined structures having nontrivial topology with knots [10]. More particularly, Faddeev and Niemi [10] recently argued that the static equilibrium configurations within the plasma are topologically stable solitons describing knotted and linked fluxtubes of helical magnetic fields. In the region close to such fluxtubes, we suppose the magnetic field intensity may be as high as B_0. In view of this, a study of the action of strong magnetic field and the fluxtubes of magnetic fields on atoms and molecules becomes of great interest in theoretical and applicational *plasmachemistry*. Possible applications are conceivable for the new chemical species of magnecules.

As a result of the action of a very strong magnetic field, atoms attain a great binding energy as compared to the case of zero magnetic field. Even at intermediate $B \simeq B_0$, the binding energy of atoms greatly deviates from that of the zero-field case, and even lower field intensities may essentially affect chemical properties of molecules of heavy atoms. This occurrence permits the creation of various other bound states in molecules, clusters and bulk matter [9, 11, 12].

The paper by Lai [12] is focused on very strong magnetic fields, $B \gg B_0$, motivated by astrophysical applications, and provides a good survey of the early and recent studies in the field, including studies on the intermediate range, $B \simeq B_0$, multi-electron atoms, and H_2 molecule. Several papers using variational/numerical and/or analytical approaches to the problem of light and heavy atoms, ions, and H_2 molecule in strong magnetic field, have been published within the last years (see, e.g., references in [12]). However, highly magnetized molecules of heavy atoms have not been systematically investigated until Santilli's proposal for the new species of magnecules [1]. One of the surprising implications is that for some diatomic molecules of heavy atoms, the molecular binding energy is predicted to be several times bigger than the ground state energy of individual atom [13].

To estimate the intensity of the magnetic field which causes considerable deformation of the ground state electron orbit of the H atom, one can formally com-

pare Bohr radius of the H atom in the ground state, in zero external magnetic field, $a_0 = \hbar^2/me^2 \simeq 0.53 \cdot 10^{-8}$ cm = 1 a.u., with the radius of orbit of a single electron moving in the external static uniform magnetic field $\vec{B}$.

The mean radius of the orbital of a single electron moving in a static uniform magnetic field can be calculated exactly by using Schrödinger's equation, and it is given by

$$R_n = \sqrt{\frac{n+1/2}{\gamma}}, \tag{8.A.1}$$

where $\gamma = eB/2\hbar c$, B is intensity of the magnetic field pointed along the z axis, $\vec{B} = (0,0,B)$, $\vec{r} = (r,\varphi,z)$ in cylindrical coordinates, and $n = 0,1,\ldots$ is the principal quantum number. Thus, the radius of the orbit takes *discrete* set of values (8.A.1), and is referred to as Landau radius. This is in contrast to well known *classical* motion of electrons in an external magnetic field, with the radius of the orbit being of a continuous set of values.

The energy levels E_n of a single electron moving in said external magnetic field are referred to as Landau energy levels,

$$E_n = E_n^{\perp} + E_{k_z}^{\parallel} = \hbar\Omega(n+\frac{1}{2}) + \frac{\hbar^2 k_z^2}{2m}, \tag{8.A.2}$$

where $\Omega = eB/mc$ is so called cyclotron frequency, and $\hbar k_z$ is a projection of the electron momentum $\hbar\vec{k}$ on the direction of the magnetic field, $-\infty < k_z < \infty$, m is mass of electron, and $-e$ is charge of electron.

Landau's energy levels $E_n^{\perp}$ correspond to a discrete set of round orbits of the electron which are projected to the transverse plane. The energy $E_{k_z}^{\parallel}$ corresponds to a free motion of the electron in parallel to the magnetic field (*continuous* spectrum), with a conserved momentum $\hbar k_z$ along the magnetic field.

In regard to the above review of Landau's results, we recall that in the general case of a *uniform* external magnetic field the coordinate and spin components of the total wave function of the electron can always be separated.

The corresponding coordinate component of the total wave function of the electron, obtained as an exact solution of Schrödinger equation for a single electron moving in the external magnetic field with vector-potential chosen as $A_r = A_z = 0$, $A_\varphi = rB/2$,

$$-\frac{\hbar^2}{2m}\left(\partial_r^2 + \frac{1}{r}\partial_r + \frac{1}{r^2}\partial_\varphi^2 + \partial_z^2 - \gamma^2 r^2 + 2i\gamma\partial_\varphi\right)\psi = E\psi, \tag{8.A.3}$$

is of the following form [9]:

$$\psi_{n,s,k_z}(r,\varphi,z) = \sqrt{2\gamma} I_{ns}(\gamma r^2)\frac{e^{il\varphi}}{\sqrt{2\pi}}\frac{e^{ik_z z}}{\sqrt{L}}, \tag{8.A.4}$$

where $I_{ns}(\rho)$ is Laguerre function,

$$I_{ns}(\rho) = \frac{1}{\sqrt{n!s!}} e^{-\rho/2}\rho^{(n-s)/2} Q_s^{n-s}(\rho); \tag{8.A.5}$$

Q_s^{n-s} is Laguerre polynomial, L is normalization constant, $l = 0,\pm1,\pm2,\ldots$ is azimuthal quantum number, $s = n - l$ is radial quantum number, and $\rho = \gamma r^2$.

Spin components of the total wave function are trivially given by

$$\psi(\tfrac{1}{2}) = \begin{pmatrix} 1 \\ 0 \end{pmatrix}, \quad \psi(-\tfrac{1}{2}) = \begin{pmatrix} 0 \\ 1 \end{pmatrix}. \tag{8.A.6}$$

with the corresponding energies $E_{spin} = \pm\mu_0 B$, to be added to the energy (8.A.2); $\mu_0 = e\hbar/2mc$ is Bohr magneton.

For the *ground* Landau level, i.e. at $n = 0$ and $s = 0$, and zero momentum of electron in the z-direction, i.e. $\hbar k_z = 0$, we have from (8.A.2)

$$E_0^{\perp} = \frac{e\hbar B}{2mc}, \tag{8.A.7}$$

and due to Eq. (8.A.4) the corresponding normalized ground state wave function is

$$\psi_{000}(r,\varphi,z) = \psi_{000}(r) = \sqrt{\frac{\gamma}{\pi}}\, e^{-\gamma r^2/2}, \tag{8.A.8}$$

$\int_0^\infty \int_0^{2\pi} r dr d\varphi\, |\psi_{000}|^2 = 1.$

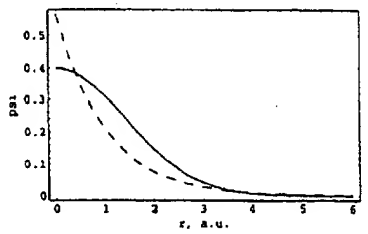

Figure 8.A.1. Landau's ground state wave function of a single electron, ψ_{000} (solid curve), Eq. (8.A.8), in a strong external magnetic field $B = B_0 = 2.4 \cdot 10^9$ Gauss, as function of the distance r in cylindrical coordinates, and (for a comparison) the hydrogen ground state wave function (at zero external magnetic field), $(1/\sqrt{\pi})e^{-r/a_0}$ (dashed curve), as function of the distance r in spherical coordinates. The associated probability densities are shown in Fig. 8.A.2; 1 a.u. $= a_0 = 0.53 \cdot 10^{-8}$ cm.

The corresponding (smallest) Landau's radius of the orbit of electron is

$$R_0 = \sqrt{\frac{\hbar c}{eB}} \equiv \sqrt{\frac{1}{2\gamma}}, \tag{8.A.9}$$

in terms of which ψ_{000} reads

$$\psi_{000} = \sqrt{\frac{1}{2\pi R_0^2}}\, e^{-\frac{r^2}{4R_0^2}}. \tag{8.A.10}$$

Figure 8.A.1 depicts Landau's ground state wave function of a single electron, ψ_{000}, in the strong external magnetic field $B = B_0 = 2.4 \cdot 10^9$ Gauss ($R_0 = 1$ a.u.), and (for a comparison) of the hydrogen ground state wave function, at zero external magnetic field, $(1/\sqrt{\pi})e^{-r/a_0}$. Figures 8.A.2 and 8.A.3 display the associated probability density of the electron as a function of the distance r from the center of the orbit, the radius of which is about 1 a.u.

The condition that Landau's radius is smaller than Bohr's radius, $R_0 < a_0$ (which is adopted here as the condition of a considerable "deformation" of the electron orbit

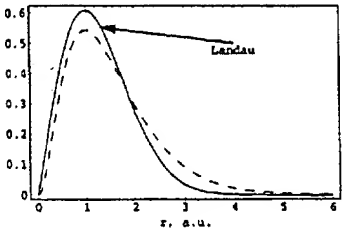

Figure 8.A.2. Probability density for the case of Landau's ground state of a single electron, $2\pi r|\psi_{000}|^2$ (solid curve), Eq. (8.A.8), in a strong external magnetic field $B = B_0 = 2.4 \cdot 10^9$ Gauss, as a function of the distance r in cylindrical coordinates, and (for a comparison) the probability density of the hydrogen atom ground state (at zero external magnetic field), $4\pi r^2|(1/\sqrt{\pi})e^{-r/a_0}|^2$ (dashed curve), as function of the distance r in spherical coordinates. The associated wave functions are shown in Fig. 8.A.1; 1 a.u. $= 0.53 \cdot 10^{-8}$ cm.

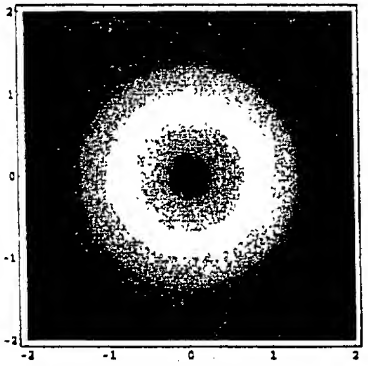

Figure 8.A.3. Contour plot of the (r, φ) probability density for the case of Landau's ground state of a single electron, $2\pi r|\psi_{000}|^2$, Eq. (8.A.8), in strong external magnetic field $B = B_0 = 2.4 \cdot 10^9$ Gauss, as a function of the distance in a.u. (1 a.u. $= 0.53 \cdot 10^{-8}$ cm). The lighter area corresponds to a bigger probability of finding the electron. The set of maximal values of the probability density is referred to as an "orbit".

of the H atom) then implies

$$B > B_0 = \frac{m^2 ce^3}{\hbar^3} = 2.351 \cdot 10^9 \text{ Gauss}, \qquad (8.A.11)$$

where m is mass of electron. Equivalently, this deformation condition corresponds to the case when the binding energy of the H atom, $|E_0^{Bohr}| = |-me^4/2\hbar^2| = 0.5$ a.u. $= 13.6$ eV, is smaller than the ground Landau energy $E_0^{\perp}$.

The above critical value of the magnetic field, B_0, is naturally taken as an *atomic unit* for the strength of the magnetic field, and corresponds to the case when the pure Coulomb interaction energy of the electron with nucleus is equal to the interaction energy of the single electron with the external magnetic field, $|E_0^{Bohr}| = E_0^{\perp} = 13.6$ eV, or equivalently, when Bohr radius is equal to Landau radius, $a_0 = R_0 = 0.53 \cdot 10^{-8}$ cm.

It should be stressed here that the characteristic parameters, Bohr's energy $|E_0^{Bohr}|$ and Bohr's radius a_0, of the H atom have the purpose to establish a criterium for the critical strength of the external magnetic field of the hydrogen atom under the conditions here considered. For other atoms the critical value of the magnetic field may be evidently different.

After outlining the quantum dynamics of a single electron in an external magnetic field, Aringazin [8] turns to the consideration of the H atom under an external static uniform magnetic field.

In the cylindrical coordinate system (r, φ, z), in which the external magnetic field is $\vec{B} = (0, 0, B)$, i.e., the magnetic field is directed along the z-axis, Schrödinger's equation for an electron moving around a fixed proton (Born-Oppenheimer approximation) in the presence of the external magnetic field is given by

$$-\frac{\hbar^2}{2m}\left(\partial_r^2 + \frac{1}{r}\partial_r + \frac{1}{r^2}\partial_\varphi^2 + \partial_z^2 + \frac{2me^2}{\hbar^2\sqrt{r^2+z^2}} - \gamma^2 r^2 + 2i\gamma\partial_\varphi\right)\psi = E\psi, \qquad (8.A.12)$$

where $\gamma = eB/2\hbar c$.

The main problem in the nonrelativistic study of the hydrogen atom in an external magnetic field is to solve the above Schrödinger equation and find the energy spectrum. This equation is not analytically tractable so that one is led to use approximations.

In the approximation of a *very* strong magnetic field, $B \gg B_0 = 2.4 \cdot 10^9$ Gauss, Coulomb interaction of the electron with the nucleus is not important, in the transverse plane, in comparison to the interaction of the electron with external magnetic field. Therefore, in accord to the exact solution (8.A.4) for a single electron, one can look for an approximate ground state solution of Eq. (8.A.12) in the form of factorized transverse and longitudinal parts,

$$\psi = e^{-\gamma r^2/2}\chi(z), \qquad (8.A.13)$$

where $\chi(z)$ is the longitudinal wave function to be found. This is so called *adiabatic approximation*. In general, the adiabatic approximation corresponds to the case when the transverse motion of electron is totally determined by the intense magnetic field, which makes the electron "dance" at its cyclotron frequency. Specifically, the radius of the orbit is then *much smaller* than Bohr radius, $R_0 \ll a_0$. The remaining problem is thus to find longitudinal energy spectrum, in the z direction.

Inserting tehe wave function (8.A.13) into the Schrödinger equation (8.A.12), multiplying it by ψ^*, and integrating over variables r and φ in cylindrical coordinate system, one gets the following equation characterizing the z dependence of the wave function:

$$\left(-\frac{\hbar^2}{2m}\frac{d^2}{dz^2} + \frac{\hbar^2\gamma}{m} + C(z)\right)\chi(z) = E\chi(z), \qquad (8.A.14)$$

where

$$C(z) = -\sqrt{\gamma}e^2 \int_0^\infty \frac{e^{-\rho}}{\sqrt{\rho+\gamma z^2}}\,d\rho = -e^2\sqrt{\pi\gamma}\,e^{\gamma z^2}[1-\mathrm{erf}(\sqrt{\gamma}|z|)], \qquad (8.A.15)$$

where $\mathrm{erf}(x)$ is the error function.

The arising effective potential $C(z)$ is of a nontrivial form, which does not allow to solve Eq. (8.A.14) analytically, so one can approximate it by simple potentials, to make an estimation on the ground state energy and wave function of the H atom.

At high intensity of the magnetic field, $\gamma \gg 1$ so that under the condition $\gamma\langle z^2\rangle \gg 1$ one can ignore ρ in the square root in the integrand in Eq. (8.A.15). Then, one can perform the simplified integral and obtain the result

$$C(z) \simeq V(z) = -\frac{e^2}{|z|}, \quad \text{at } \gamma\langle z^2\rangle \gg 1, \qquad (8.A.16)$$

which appears to be a pure Coulomb interaction of electron with the nucleus, in the z direction. Due to the exact result (8.A.15), $C(z)$ tends to zero as $z \to \infty$. However, a remarkable implication of the exact result is that $C(z)$ is *finite* at $z = 0$, namely, $C(0) = -\sqrt{\pi\gamma}\,e^2$, so that the effective potential $C(z)$ can *not* be well approximated by the Coulomb potential.

The exact potential $C(z)$ can be well approximated by the *modified* Coulomb potential,

$$C(z) \simeq V(z) = -\frac{e^2}{|z|+z_0}, \qquad (8.A.17)$$

where z_0 is a parameter, $z_0 \neq 0$, which depends on the field intensity B due to

$$z_0 = -\frac{e^2}{C(0)} = \frac{1}{\sqrt{\pi\gamma}} = \sqrt{\frac{2\hbar c}{\pi eB}}. \qquad (8.A.18)$$

The analytic advantage of this approximation is that $V(z)$ is *finite* at $z = 0$, being of Coulomb-type form. Therefore, Eq. (8.A.14) reduces to *one-dimensional* Schrödinger equation for the Coulomb-like potential,

$$\left(\frac{\hbar^2}{2m}\frac{d^2}{dz^2} + \frac{e^2}{|z|+z_0} + \frac{\hbar^2\gamma}{m} + E\right)\chi(z) = 0. \qquad (8.A.19)$$

In the atomic units ($e = \hbar = m = 1$), using the notation

$$E' = \frac{\hbar^2\gamma}{m} + E, \quad n^2 = \frac{1}{-2E'}, \qquad (8.A.20)$$

introducing the new variable $x = 2z/n$, and dropping $x_0 = 2z_0/n$, to simplify representation, the above equation can be rewritten as

$$\left[\frac{d}{dx^2} + \left(-\frac{1}{4} + \frac{n}{x}\right)\right]\chi(x) = 0, \qquad (8.A.21)$$

where $x > 0$ is assumed. Introducing new function $v(x)$ defined as $\chi(x) = xe^{-x/2}v(x)$, one gets the final form of the equation,

$$xv'' + (2-x)v' - (1-n)v = 0. \qquad (8.A.22)$$

Noting that it is a particular case of Cummer's equation,

$$xv'' + (b-x)v' - av = 0, \qquad (8.A.23)$$

the general solution is given by

$$v(x) = C_1\,{}_1F_1(a,b,x) + C_2U(a,b,x), \qquad (8.A.24)$$

where

$${}_1F_1(a,b,x) = \frac{\Gamma(b)}{\Gamma(b-a)\Gamma(a)}\int_0^1 e^{xt}t^{a-1}(1-t)^{b-a-1}\,dt \qquad (8.A.25)$$

and

$$U(a,b,x) = \frac{1}{\Gamma(a)}\int_0^\infty e^{-xt}t^{a-1}(1+t)^{b-a-1}\,dt \qquad (8.A.26)$$

are the confluent hypergeometric functions, and $C_{1,2}$ are constants; $a = 1-n$ and $b = 2$. Hence, for $\chi(x)$ one has

$$\chi(x) = (|x|+x_0)e^{-(|x|+x_0)/2}\left[C_1^{\pm}\,{}_1F_1(1-n,2,|x|+x_0) + C_2^{\pm}U(1-n,2,|x|+x_0)\right], \qquad (8.A.27)$$

where the parameter x_0 has been restored, and the "$\pm$" sign in $C_{1,2}^{\pm}$ corresponds to the positive and negative values of x, respectively (the modulus sign is used for brevity).

Let us consider first the $x_0 = 0$ case. The first hypergeometric function ${}_1F_1(1-n,2,x)$ is finite at $x = 0$ for any n. At big x, it diverges exponentially, unless n is an integer number, $n = 1,2,\ldots$, at which case it diverges polynomially. The second hypergeometric function $U(1-n,2,x)$ behaves differently, somewhat as a mirror image of the first one. In the limit $x \to 0$, it is finite for integer $n = 1,2,3,\ldots$, and diverges as $1/x$ for noninteger $n > 1$ and for $0 \leq n < 1$. In the limit $x \to \infty$, it diverges polynomially for integer n, tends to zero for noninteger $n > 1$ and for $n = 0$, and diverges for noninteger $0 < n < 1$.

In general, because of the prefactor $xe^{-x/2}$ in the solution (8.A.27) which cancels some of the divergencies arising from the hypergeometric functions, we should take into account *both* of the two linearly independent solutions, to get the most general form of normalizable wave functions.

As a consequence, for $x_0 \neq 0$ the eigenvalues may *differ* from those corresponding to $n = 1,2,\ldots$ (which is a counterpart of the principal quantum number in the ordinary hydrogen atom problem) so that n is allowed to take some *non-integer* values from 0 to ∞, provided that the wave function is normalizable.

For even states, in accord to the symmetry of wave function under the inversion $z \to -z$, one has

$$C_1^+ = C_1^-, \quad C_2^+ = C_2^-, \quad \chi'(0) = 0. \qquad (8.A.28)$$

Also, since $n = 1$ gives $E' = -1/(2n^2) = -1/2$ a.u., one should seek normalizable wave function for n in the interval $0 < n < 1$, in order to achieve lower energy value. If successful, $n = 1$ indeed does not characterize the ground state. Instead, it may correspond to some excited state.

Analysis shows that *normalizable* wave functions, as a combination of two linearly independent solutions, for the modified Coulomb potential *does exist* for various *non-integer* n. Focusing on the ground state solution, Aringazin considers values of n ranging from 0 to 1. Remind that $E' = -1/2n^2$ so that for $n < 1$ the energy lower than $E' = -0.5$ a.u.

For $n < 1$, the first hypergeometric function is not suppressed by the prefactor $xe^{-x/2}$ in the solution (8.A.27) at large x so we are led to discard it as an unphysical solution by putting $C_1 = 0$. A normalizable ground state wave function for $n < 1$ is thus may be given by the second term in the solution (8.A.27). Indeed, the condition $\chi'(x)_{|x=0} = 0$ implies

$$\frac{1}{2}e^{-(x+x_0)/2}C_2[(2-x-x_0)U(1-n,2,x+x_0)- \\ -2(1-n)(x+x_0)U(2-n,3,x+x_0))]_{|x=0} = 0. \quad (8.A.29)$$

The l.h.s of this equation depends on n and x_0, so one can select some field intensity B, calculate associated $x_0 = x_0(B)$ and find n, from which one obtains the ground state energy E'. On the other hand, for the ground state this condition can be viewed, *vice versa*, as an equation to find x_0 at some selected n.

For example, taking the noninteger value $n = 1/\sqrt{15.58} \simeq 0.253 < 1$ Aringazin found $x_0 = 0.140841$. This value is in confirmation with the result $x_0 = 0.141$ obtained by Heyl and Hernquist [14]. On the other hand, x_0 is related in accord to Eq. (8.A.18) to the intensity of the magnetic field, $x_0 = 2z_0/n$, from which one obtains $B \simeq 4.7 \cdot 10^{12}$ Gauss. Hence, at this field intensity the ground state energy of the hydrogen atom is determined by $n = 1/\sqrt{15.58}$.

The total ground state wave function is given by

$$\psi(r,\varphi,x) \simeq \sqrt{\frac{1}{2\pi R_0^2}}e^{-\frac{r^2}{4R_0^2}}(|x|+x_0)e^{(|x|+x_0)/2}U(1-n,2,|x|+x_0), \quad (8.A.30)$$

where n is determined due the above procedure, and the associated three-dimensional probability density is schematically depicted in Fig. 8.A.4.

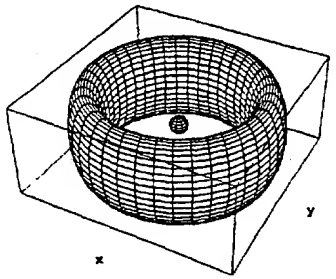

Figure 8.A.4. A schematic view on the H atom in the ground state under a very strong external magnetic field $\vec{B} = (0,0,B)$, $B \gg B_0 = 2.4 \cdot 10^9$ Gauss, due to the *modified* Coulomb approximation studied in the text. The electron moves on the Landau orbit of small radius $R_0 \ll 0.53 \cdot 10^{-8}$ cm resulting in the toroidal structure used for the new chemical species of magnecules. The vertical size of the atom is comparable to R_0. The spin of the electron is antiparallel to the magnetic field.

One can see that the problem remarkably difference than the ordinary three-dimensional problem of the hydrogen atom, for which the principal quantum number

n must be integer to get normalizable wave functions, and the value $n = 1$ corresponds to the lowest energy.

The modified Coulomb potential approach provides qualitatively correct behavior, and suggests a *single* Landau-type orbit shown in Fig. 8 A.4 for the *ground* state charge distribution of the hydrogen atom. This is in full agreement with Santilli's study [1, 11] of the hydrogen atom in a strong magnetic field.

Accurate analytic calculation of the ground and excited hydrogen wave functions made by Heyl and Hernquist [14] in the adiabatic approximation leads to the longitudinal parts of the wave functions shown in Fig. 8.A.5, which reproduces the original Fig. 3 of their work; $\zeta = 2\pi\alpha z/\lambda_c$; $B = 4.7 \cdot 10^{12}$ Gauss. They used the modified Coulomb potential of the type (8.A.17), and the additional set of linearly independent solutions of the one-dimensional modified Coulomb problem in the form

$$(|x|+x_m)e^{-(|x|+x_m)/2}{}_1F_1(1-n,2,|x|+x_m)\int^{|x|+x_m}\frac{e^t}{(t\,{}_1F_1(1-n,2,t))^2}\,dt, \quad (8.A.31)$$

where $m = 0$ corresponds to the ground state. For the ground state with $n = 1/\sqrt{15.58}$, they found $x_0 = 0.141$, which corresponds to $B = 4.7 \cdot 10^{12}$ Gauss. This result is in agreement with the study made above.

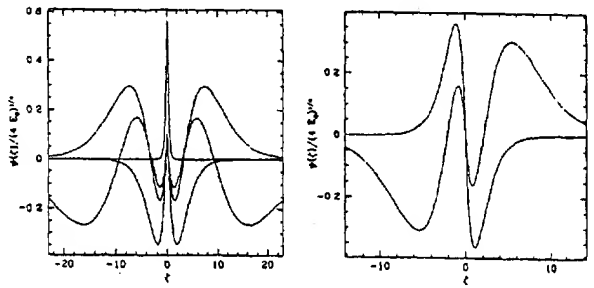

Figure 8.A.5. The axial wavefunctions of hydrogen in an intense magnetic field (analytic calculation) for $B = 4.7 \cdot 10^{12}$ Gauss. The first four even states with axial excitations, $|000\rangle$ (ground state), $|002\rangle$, $|004\rangle$, and $|006\rangle$ (left panel), and odd states $|001\rangle$ and $|003\rangle$ (right panel) are depicted; $n = 1/\sqrt{15.58}$, $\zeta = 2z/n$ corresponds to x in the used notation; z in a.u., 1 a.u. $= 0.53 \cdot 10^{-8}$ cm (reproduction of Figure 3 by Heyl and Hernquist [14]).

One can see from Fig. 8.A.5 that the peak of the ground state wave function $|000\rangle$ is at the point $z = 0$, while the largest peaks of the excited wave functions are away from the point $z = 0$ (as it was expected to be). Consequently, the associated longitudinal probability distributions (square modules of the wave functions multiplied by the volume factor of the chosen coordinate system) are symmetric with respect to $z \to -z$, and their maxima are placed in the center $z = 0$ for the ground state, and away from the center for the excited states. The computed ground state $|000\rangle$ binding energy of the hydrogen atom for different field intensities are [14]:

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Magnetic field B (Gauss)	Binding energy, $\|000\rangle$ state (Rydberg)
4.7×10^{12}	15.58
9.4×10^{12}	18.80
23.5×10^{12}	23.81
4.7×10^{13}	28.22
9.4×10^{13}	33.21
23.5×10^{13}	40.75
4.7×10^{14}	47.20

Heyl and Hernquist calculated the first-order perturbative corrections to the above energies and obtained the values, which are in a good agreement with the results by Ruder *et al.* [9] and Lai [12].

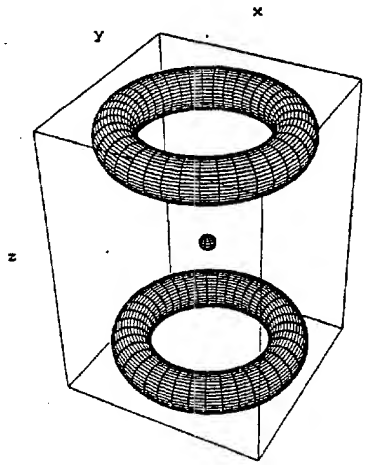

Figure 8.A.6. A schematic view on the H atom in an excited state under a very strong external magnetic field $\vec{B} = (0, 0, B)$, $B \gg B_0 = 2.4 \cdot 10^9$ Gauss. One electron moves simultaneously on two toroidal orbits of radius R_0 which are shown schematically as torii in the different (x, y) planes, one torus at the level $z = -L_z$ and the other at the level $z = +L_z$, with the nucleus shown in the center at $z = 0$. Each torus represents the (x, y) probability distribution as shown in Fig. 8.A.3 but with small Landau radius, $R_0 \ll a_0$. The spin of electron is aligned antiparallel to the magnetic field.

The associated probability density of the above excited states is evidently of a cylindrical (axial) symmetry and can be described as two Landau orbits of radius R_0 in different (r, φ) planes, one at the level $z = -L_z$, and the other at the level $z = +L_z$, with the nucleus at $z = 0$, as schematically depicted in Fig. 8.A.6. Presence of two

Landau orbits occurs in accord to the excited wave functions, which is symmetrical with respect to the inversion, $z \to -z$, and the largest peaks of which are away from the center $z = 0$. The electron moves simultaneously on these two Landau orbits.

A review of approximate, variational, and numerical solutions can be found in the paper by Lai [12]. The accuracy of numerical solutions is about 3%, for the external magnetic field in the range from 10^{11} to 10^{15} Gauss. Particularly, due to the variational results [12], the z-size of the hydrogen atom in the ground state is well approximated by the formula $L_z \simeq [\ln(B/B_0)]^{-1}$ a.u.; the transverse (Landau) size is $L_\perp \simeq (B/B_0)^{-1/2}$ a.u.; and the ground state energy $E \simeq -0.16[\ln(B/B_0)]^2$ a.u., with the accuracy of few percents, for $b \equiv B/B_0$ in the range from 10^2 to 10^6. One can see for $B = 100B_0$, that the variational study predicts the ground state energy $E = -3.4$ a.u. $= -92.5$ eV, the transverse size $L_\perp$ of about 0.1 a.u. $= 0.53 \cdot 10^{-9}$ cm, and the z-size L_z of about 0.22 a.u. This confirms the result of the modified Coulomb analytic approach.

Since a zero-field ground state case is characterized by perfect spherically symmetric electron charge distribution in the H atom, intermediate intensities of the magnetic field are naturally expected to imply a distorted spherical distribution. However, a deeper analysis is required for the intermediate magnetic field intensities because the adiabatic approximation is not longer valid in this case.

As to the multi-electron atoms, an interesting problem is to study action of very strong external magnetic field on He atom (see. e.g., Refs. [12, 14]) and on the multi-electrons heavy atoms, with outer electrons characterized by a *nonspherical* charge distribution, such as the p-electrons in Carbon atom, orbitals of which penetrate the orbitals of inner electrons. In fact, a very intense magnetic field would force such outer electrons to follow *small round* toroidal orbits. In addition to the effect of a direct action of the magnetic field on the inner electrons, a series of essential rearrangements of the whole electron structure of the atom seems to occur with the variation of the field strength. The magnetic field competes with the Coulomb energy, which is different for different states of electrons, and with the electron-electron interactions, including spin pairings. However, it is evident that at sufficiently strong fields, all the electron spins are aligned antiparallel to the magnetic field — fully spin polarized configuration — while at lower field intensities various partial spin polarized configurations are possible.

In accord to the numerical calculations based on the density matrix theory by Johnsen and Yngvason [13], which is in good agreement with the Hartree-Fock treatment of a very strong magnetic field, the inner domain in iron atom (26 electrons) is characterized by a slightly distorted spherically symmetric distribution, even at the intensities as high as $B = 100B_0 \ldots 1000B_0$. The outer domain appears to be of specific, highly elongated distribution along the direction of the magnetic field as shown in Fig. 8.A.7. The possible interpretation that the inner electrons remain to have a spherical distribution while outer electrons undergo the squeeze seems to be not correct unless the spin state of the iron atom is verified to be partially polarized. So, we can conclude that all the electrons are in the highly magnetically polarized state (Landau state mixed a little by Coulomb interaction), and the electronic structure is a kind of *Landau multi-electron cylindrical shell*, with the spins of all the electrons being aligned antiparallel to the magnetic field (fully spin polarized configuration).

Another remark regarding Fig. 8.A.7 is that the contours indicating a nearly spherical distribution will always appear since the Coulomb center (nucleus) is not totally eliminated from the consideration (non-adiabatic approximation), and it forces a spherical distribution to some degree, which evidently depends on the distance

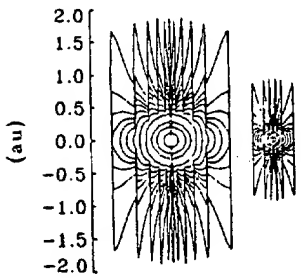

Figure 8.A.7. Contour plots of the (r, z) plane electronic density of iron atom according to the density matrix theory at two different magnetic field strengths, 10^{11} Gauss (left) and 10^{12} Gauss (right). The outermost contour encloses 99% of the negative charge, the next 90%, then 80% etc., and the two innermost 5% and 1% respectively (reproduction of Fig. 5 by Johnsen and Yngvason [13]).

from the center (closer to the center, more sphericity). We note that outer contours in Fig. 8.A.7 is in qualitative agreement with Fig. 8.A.6 in the sense that the predicted charge distribution reveals symmetry under the inversion $z \rightarrow -z$, with the characteristic z-elongated Landau-type orbits.

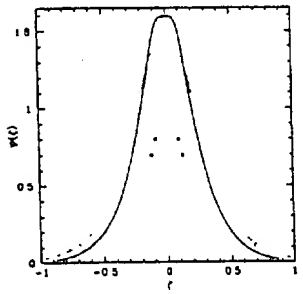

Figure 8.A.8. A schematic view of the ground and first-excited state of H_2^+ ion. The solid line traces $|000\rangle$, and the dashed line follows $|0\text{-}10\rangle$. The triangles give the positions of the protons for the ground state and the squares for the excited state. The magnetic field $B = 4.7 \cdot 10^{12}$ Gauss is pointed along the internuclear axis; $\zeta = 2\pi\alpha z/\lambda_e$ denotes z in a.u.; 1 a.u. $= 0.53 \cdot 10^{-8}$ cm (reproduction of Figure 5 by Heyl and Hernquist [14]).

An interesting problem is to study H_2 molecule under the action of a strong external static uniform magnetic field using Schrödinger's equation. However, prior to that study, it would be useful to investigate the simpler two-center H_2^+ ion, since it can give valuable information on the features of the full hydrogen molecule under the action of a strong magnetic field. We refer the interested reader to Refs. [12, 14, 15] for studies on H_2^+ ion and H_2 molecule in strong magnetic field. Figure 8.A.8 displays the ground and first excited state wave functions of H_2^+ [14].

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HADRONIC JOURNAL 21, 789-894 (1998)

THEORETICAL PREDICTION AND EXPERIMENTAL VERIFICATIONS OF THE NEW CHEMICAL SPECIES OF *Magnecules*

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Received December 23, 1998

Abstract

As a result of comprehensive studies by various scholars initiated back in 1978, a generalization-covering of quantum mechanics under the name of *hadronic mechanics* has been built and has now reached operational maturity. Thanks to these results, D. D. Shillady and I have introduced in three preceding papers a generalization-covering of quantum chemistry under the name of *hadronic chemistry* and proved its effectiveness in achieving representations of molecular data accurate to several digits. In this paper I present, apparently for the first time, the most compelling experimental evidence to date supporting hadronic mechanics and chemistry, the theoretical prediction and several independent experimental verifications of a *new chemical species*, i.e., atoms and molecules bonded by a *new force*. The origin of the new species rest in the magnetic moment of electrons in their *orbits* around nuclei, which has been ignored throughout this century due to their spherical distribution. In this paper I show that the polarization in a plane of the orbit of the electron of the hydrogen atom implies the emergence of a magnetic moment which is 1,316 *bigger* than the magnetic moment of the nucleus (the proton). Such a large value is then sufficient to permit the theoretical prediction of corresponding strong magnetic bonds between atoms and molecules which are stable at ordinary conditions. Various consistency aspects imply the necessary use of hadronic mechanics and chemistry, e.g., to prevent that all molecules are ferromagnetic. In view of the magnetic origin of the new bond, I submit the names of *magnecules* for the new species, in order to distinguish it from the conventional "molecules" denoting valence bonds. I then present various experimental confirmations by independent laboratories on the existence and anomalous properties of magnecules in gases, liquids and solids. The memoir ends with an indication without detailed treatment that the new species implies the birth of new technologies currently under development by Toups Technology Licensing Corporation, of Largo Florida, Givaudan-Roure Corporation of Teaneck, New Jersey, and other U.S. Corporations.

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THEORETICAL PREDICTION AND EXPERIMENTAL VERIFICATIONS OF THE NEW CHEMICAL SPECIES OF *Magnecules*

Ruggero Maria Santilli

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1. INTRODUCTION

It is known by experts in the field although rarely indicated in Ph. D. courses or in the technical literature, that, despite outstanding achievements of clear historical proportions achieved throughout this century, *quantum chemistry* [1] is still afflicted by numerous fundamental unsolved problems, insufficiencies or shear inconsistencies such as:

1) The lack of a sufficiently strong molecular bonding force, because the forces currently assumed (the exchange, van der Waals and other forces) were conceived for nuclear structures in which they are known to be weak, thus demanding the additional introduction of the strong nuclear forces.

2) The impossibility to explain why the hydrogen, water and other molecules have only two hydrogen atoms, because the currently used bonding forces of nuclear type were conceived for an arbitrary number of constituents.

3) The impossibility to achieve an exact representation from unadulterated quantum principles of molecular binding energies because missing of about 2% of the experimental values, e.g., in the selfconsistent treatments.

4) More accurate representations of molecular characteristics have been recently achieved via structural modification of the coulomb law with gaussian and other factors called "screenings". However, on rigorous scientific grounds, these manipulations prohibit the very use of the term "quantum" mechanics and chemistry because gaussian screenings of coulomb force imply the loss of the hydrogen atom, the lack of stability of all electron orbits, and the absence of the very notion of "quantum" of energy which is known to requires stable orbits for its emission or absorption, as very well known. A fully similar occurrence holds for variational methods which, besides admitting unlimited number of free parameters of totally unknown origin and motivation (thus being of purely *mathematical* value), can be proved to violate the very conditions to preserve a " quantum".

5) The impossibility to conduct meaningful thermochemical representations because the 2% currently missing in the binding energy implies an error which is 50 times bigger than the average energy of a thermochemical reaction.

6) Excessive computer times in calculations despite the use of the most modern possible computers.

7) Dramatic disagreement between the correlations used in current orbital theories (which refer to an arbitrary number of electrons), and the experimental evidence that correlations only occur between *pairs* of electrons.

8) The impossibility to represent exactly electric and magnetic moments of molecules which at times are wrong even in the sign, let alone the value.

9) The prediction by quantum chemistry that all molecules are

ferromagnetic (Fig. 1.1), which is in dramatic disagreement with experimental evidence.

It is evident that the lack of solution of the above fundamental problems *is not* due to quantum chemistry per se, but rather to the main underlying theory, *quantum mechanics*. In fact, it is today known that most deficiencies are due to the complete absence of a scientific-quantitative representation by quantum mechanics of the conditions of deep overlappings of the extended wavepackets of electrons.

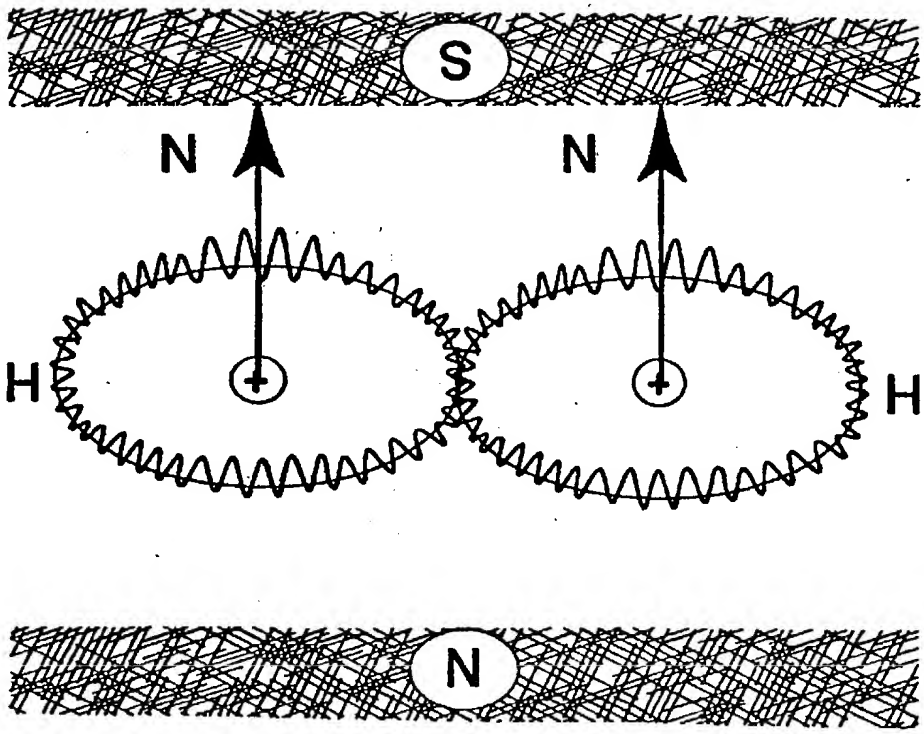

FIGURE 1.1 A schematic view of the prediction by quantum chemistry that all molecules are ferromagnetic, here expressed for the case of the simplest possible hydrogen molecule H_2 = H-H at absolute zero degree temperature and in the absence of any motions. The prediction is an un-avoidable consequence of the current conception of molecular structures in which the bond is due to exchange and other forces of nuclear type, as a

consequence of which each atom preserves its individuality. The most rigorous discipline of this century, quantum electrodynamics, then establishes that, under an external magnetic field South–North the orbits of all valence electrons must acquire the opposite polarization North–South, resulting in a total net magnetic polarity $H_{\uparrow}$–$H_{\uparrow}$ which is in dramatic disagreement with experimental evidence. The only way known to this author to resolve the inconsistency is by assuming a much stronger correlation among the two electrons which, however, is outside quantum mechanics and chemistry, but fully permitted by their hadronic coverings [2,3].

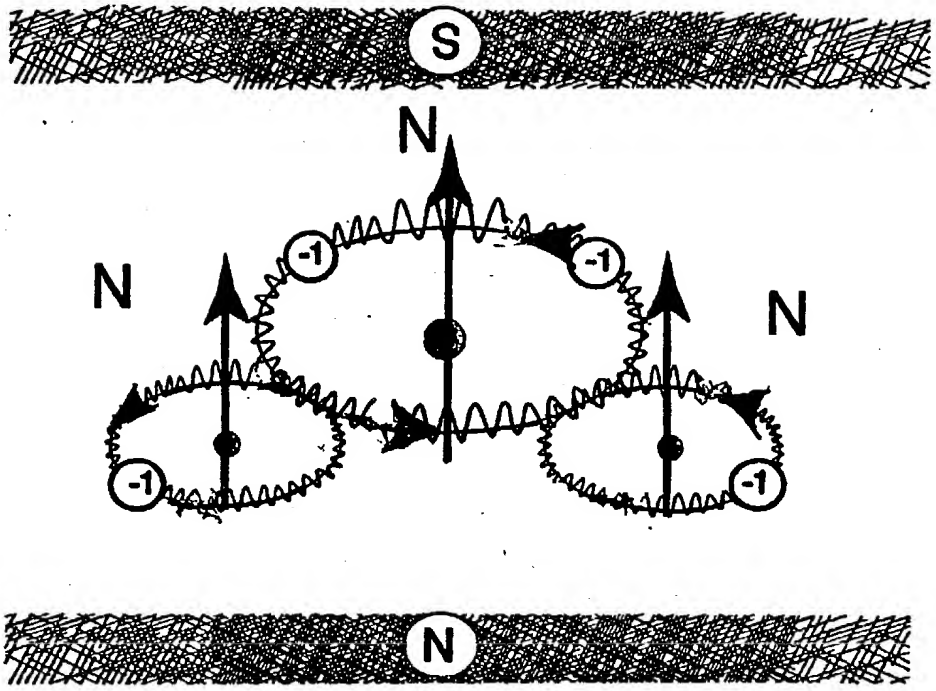

FIGURE 1.2. A schematic view of the behavior of the valence electrons of the conventional model of the water molecule H_2O = H–O–H at 0 K under an external magnetic field South–North. As it is the case for the hydrogen molecule, quantum electrodynamics predicts that, under the currently assumed independence of the atoms and weak correlations, each atom

must assume a polarization North-South opposite to that of the external field, resulting in the total net magnetic polarity of the water molecule $H_{\uparrow}-O_{\uparrow\uparrow}-H_{\uparrow}$ which is also in dramatic disagreement with experimental evidence, since water is diamagnetic as well known. After studying this inconsistency for years, the only resolution I know is the conception of a new model of the water molecule as achieved by hadronic mechanics and chemistry [2,3].

Quantum mechanics is *linear, local-differential and potential-hamiltonian-unitary,* while ***the conditions of deep overlapping of the wavepackets is known to be nonlinear, nonlocal-integral and nonpotential, thus nonhamiltonian and, therefore, nonunitary.*** Note that the *nonlocality* is caused by the overlapping of the "extended wavepackets" of the electrons while the charge remains perfectly "point-like".

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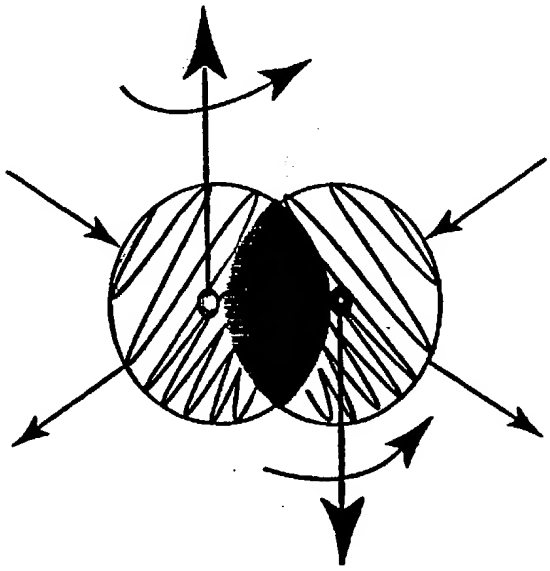

FIGURE 1.3: A schematic view of the physical conditions at the foundation of the new chemical species introduced in this paper, the deep overlapping of the extended wavepackets of the valence electrons under their point-like charge structure. These conditions are known to be nonlinear, nonlocal and nonpotential, thus nonhamiltonian-nonunitary and, therefore, outside any realistic hope of scientific treatment via quantum

mechanics and chemistry. It was shown in papers [3] that the ignorance of the conditions of this figure in support of the quantum mechanical point–like, as well as linear, local; and potential abstraction of overlapping wavepackets of the electrons has implied the inability to reach a deeper and more accurate understanding of molecular structures.

In view of the above and other insufficiencies of quantum mechanics in all branches of science (see Ref. [2e] for a comprehensive presentation), a generalization–covering of the theory under the name of ***hadronic mechanics*** was proposed by **R. M. Santilli** [2a] when at Harvard University back in 1978 and then studied by numerous mathematicians, theoreticians and experimentalists (for a comprehensive presentation up to 1995 see monographs [2c] with an update to 1997 in memoir [2d]).

Operational maturity on the formulation and applications of quantum mechanics was reached only recently in memoir [2d] thanks to the use of the new ***iso-, geno- and hyper-mathematics*** which permitted the first known invariant formulation of nonlinear, nonlocal and nonunitary effects. Hadronic mechanics has therefore three branches called ***iso–, geno- and hyper-mechanics*** which are used for the representation of isolated–conservative–reversibles, open–nonconservative–irreversible and, irreversible–multi–valued structures, respectively. Numerous applications and experimental verifications of hadronic mechanics now exist in various fields (see the outline in Sect. 3.15 of Ref. [2d]).

Thanks to the achievement of maturity of hadronic mechanics, **R. M. Santilli** and **D. D. Shillady** [3] have recently constructed a generalization–covering of quantum chemistry under the name of ***hadronic chemistry*** which is also based on the novel ***iso-, geno- and hyper-mathematics.*** Hadronic chemistry then comprises three corresponding branches called ***iso–, geno- and hyper-chemistry,*** which are used for a more accurate representation of molecular structures, irreversible chemical reactions and biological systems, respectively.

In particular, Paper I [3a] propose the main formalism of the novel hadronic chemistry. The subsequent Papers II [3b] and III [3c] propose a novel ***isochemical model of molecular bonds*** whose main feature is the assumption that ***pairs of valence electrons from two different atoms couple themselves in a singlet quasi-particle state at short distances (of 1 fm or less) we have called isoelectronium,*** with the following main features (see Sect. 5 of Paper II [3c])

Main characteristics of the isoelectronium:

Charge: 0; spin 0; magnetic moment 0; rest energy 1.02 MeV; (1.1)

Radius $r_c = b^{-1} = 6.8432329 \times 10^{-11}$ cm $= 0.015424288$ bohrs .

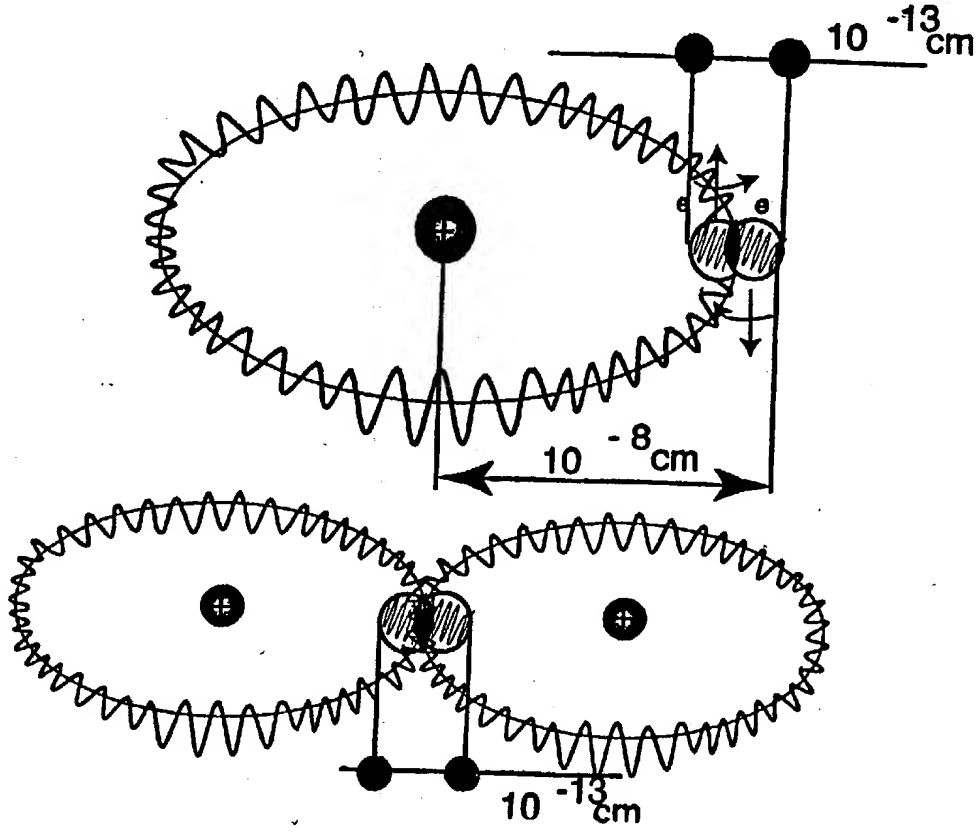

FIGURE 1.4: A schematic view of the reason why quantum mechanics is *exactly valid* for the structure of *one* hydrogen atom, but only *approximately valid* for the two atoms of the hydrogen molecule. In the former case we have very large mutual distances between the electron and the nucleus which permits an effective approximation of the electron's *wavepacket* as being *point-like*. In turn, this implies the exact applicability of the linear, local and potential axioms of quantum mechanics. In the case of the hydrogen molecule these conditions are no longer valid because we now have the *deep overlapping of the wavepackets of the valence electrons at distances of 1 fm or less*. Under these conditions, a point-like approximation of the *wavepacket* of the electrons is no longer valid. It then follows that quantum mechanics and chemistry *cannot* be exactly valid for molecular structures. Hadronic mechanics and chemistry have been constructed precisely for the quantitative invariant description of the nonlinear, nonlocal and nonpotential conditions of deep waver-overlappings of valence electrons or of other particles.

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The above new conception of molecular bonds has the following primary implications:

1) It introduces for the first time a *new* strong, *attractive forces among the two identical electrons* at distances of 1 fm or less suitable to represent the strength of molecular bonds in the physical reality, which is essentially the equivalent in chemistry of the strong force in nuclear physics.

2) It explains for the first time why the hydrogen, water and other molecules have only two hydrogen atoms. In fact, once two valence electrons are bonded into the singlet isoelectronium, they evidently reject the bonding of any additional electron.

3) Isochemistry has permitted the first representation of binding energies which is accurate to the *seventh digit.*

4) The above accurate representation occurs under the *exact validity of the basic axioms of isochemistry without ad hoc adulterations.*

5) Since the representation of binding energies is accurate to the seventh digit, isochemistry permits accurate thermochemical calculations.

6) Isochemistry implies convergence of power series much faster than those of quantum chemistry with a reduction of computer usage at least 1,000 times.

7) Isochemistry only allows correlations among *pairs* of electrons at all levels of study.

8) Isochemistry has provided a representation of electric and magnetic moments which is also accurate to *several digits,* let alone having the correct sign.

9) Isochemistry resolved the inconsistent prediction by quantum chemistry that all molecules are ferromagnetic (Figs. 1.8 and 1.9).

It should be indicated that Papers II and III provided a quantitative study of both possibilities that the isoelectronium is *stable* or *unstable,* by leaving the resolution of these alternative to subsequent studies upon the availability of additional theoretical and experimental evidence.

In particular, the *full stability* of the isoelectronium was reached under the *exact validity* of the axioms of isochemistry which yields an attractive hulten potential as representing the strong bond of the two valence electrons in the isoelectronium. By comparison, the case of *partial stability* of the isoelectronium was reached under an *approximation* of these basic principles which yields an attractive, yet weaker force responsible for the isoelectronium (rather than the much stronger hulten force).

The new evidence presented in this paper appears to favor the case of a

mostly stable isoelectronium, because necessary to resolve the inconsistency of Figs. 1.1 and 1.2.

In fact, if the bonding of valence electrons is only *partially stable*, this necessarily implies that all molecules should have a well defined magnetic polarizability whose value is dependent on the time percentage of said instability.

For instance, suppose that the isoelectronium represents only the tendency of the valence electrons to couple–correlate themselves as in Sect. 8 of Paper II [3c] (see also Fig. 1.5), and suppose that their bonding only occurs for 10% of the time, thus having unpaired valence electrons for 90% of the time as in conventional quantum chemistry.

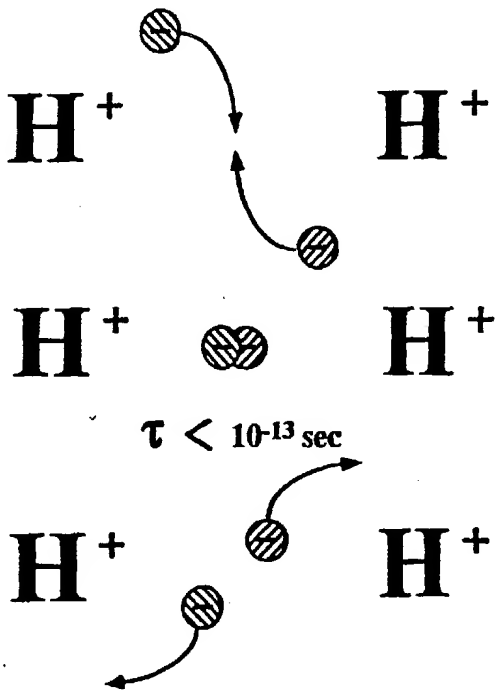

FIGURE 1.5: A schematic view of the ***mostly unstable isoelectronium*** of Papers II and III [3], essentially representing the tendency of electron pairs to have deep correlations at short distances in singlet coupling (evidently from Pauli's exclusion principle), although for a small period of time. This short lifetime originates from an *approximation* of the hulten potential well of the isoelectronium via one single gaussian. It is evident that the

lifetime of the isoelectronium increases with the improvement of the approximation via several gaussians, all the way to the full stability of the next figure.

It is then evident that, under the latter assumptions, *all molecules must acquire a net magnetic polarity under an external magnetic field, thus being ferromagnetic,* although with smaller numerical values as compared to the conventional model of molecular bonds.

The only way known to this author to resolve such a dramatic disagreement between the theory and the experimental data on the behavior of molecules under external magnetic fields, is the assumption of a mostly stable isoelectronium.

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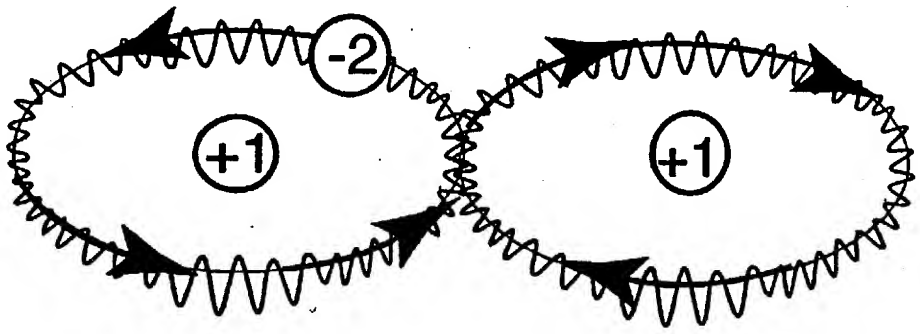

FIGURE 1.6. A schematic view of the ***mostly stable isoelectronium*** at absolute zero degree temperature and in the absence of rotations or other collective motions, here depicting the ***isochemical model of the hydrogen molecule.*** Note that ***when rotations at ordinary temperature are admitted, the model recovers the conventional space distribution of the hydrogen molecule.*** The model also holds for generic dimers HO, HC, etc. The model is here depicted in terms ***orbits*** of the valence electrons (rather than of *density distributions*). The main assumption is that the two valence electrons, one per each atom, correlate themselves into a bonded singlet state at distances of 1 fm or less, called ***isoelectronium,*** which describes a oo-shaped orbit around the respective two nuclei much similar to the orbit of a planet in certain binary star systems. The isoelectronium is then responsible for the ***attractive force***

between the two atoms. The ***binding energy*** is instead characterized by the oo–shaped orbit of the isoelectronium around the two nuclei conceptually represented in this figure via a standing wave for a particle of spin 0 and charge –2e. Note that, at ordinary temperature, rotations would reproduce the conventional spherical distribution.

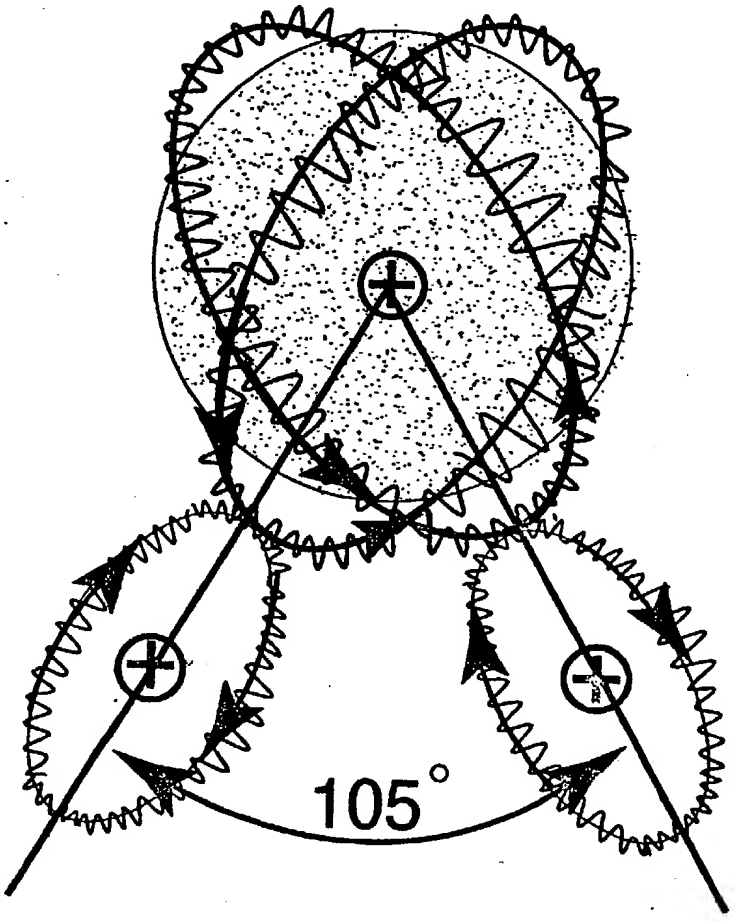

FIGURE 1.7: A schematic view of the ***isochemical model of the water molecule*** first proposed in Paper II [3c] with two isoelectronia (one per each HO dimer), presented at absolute zero degree temperature and in the absence of any rotational or other motions. ***Note again that when rotations at ordinary temperature are admitted, the model recovers the conventional "Mickey Mouse" shape of the water molecule*** [1]. The model is also depicted in terms of ***orbits*** of the valence electrons,

without precluding the description in terms of *density distributions* familiar in the existing literature. As one can see, a visual inspection of the new model resolves some of the fundamental open problems of the current conception of the water molecule, such as the lack of a sufficiently strong bonding force or the inability to explain why the water molecule has only *two* hydrogen atoms and only *one* oxygen.

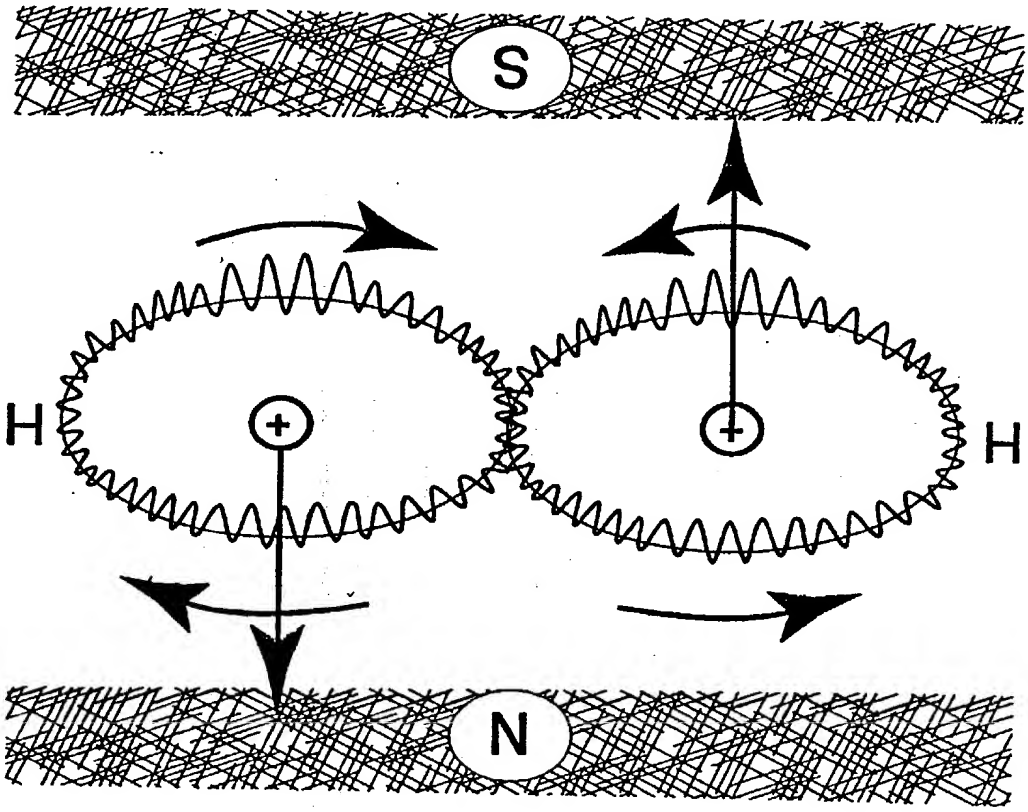

FIGURE 1.8: A schematic view of the resolution of the inconsistency of Fig. 1.1 permitted by the novel isochemical model of molecular bonds, here illustrated for the case of the simplest possible hydrogen molecule at 0 K and in the absence of any motion. In the conventional quantum model the valence electrons preserve their individuality, thus implying the mandatory prediction of a total net magnetic polarity under an external

magnetic field. For isochemistry the two valence electrons are no longer independent, but are bonded into the isoelectronium which describes an oo–shaped orbits around the two nuclei *with opposite rotational motion in the two o–branches.* The impossibility of a total net magnetic polarity is then evident and so is the resolution of the inconsistency of Fig. 1.1. Note the *necessity* for the stability of the isoelectronium for the resolution of said inconsistency.

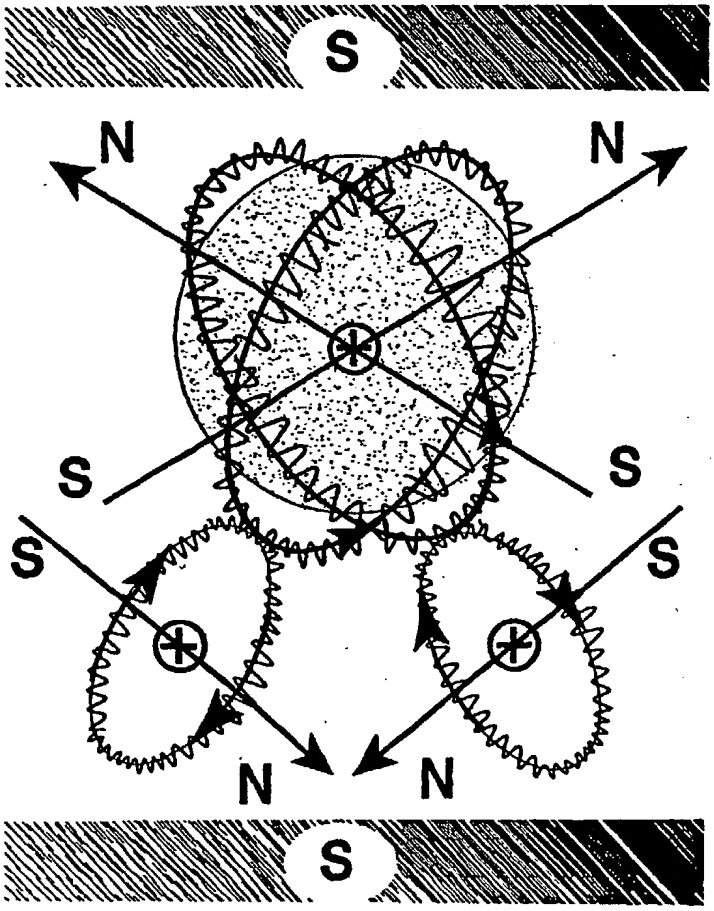

FIGURE 1.9: A schematic view, again at absolute zero degree temperature and in the absence of motions, of the resolution of the inconsistency of quantum chemistry of Fig. 1.2, namely, the impossibility for the isochemical model of the water molecule to acquire a

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net magnetic polarity under an external magnetic field. Note that the resolution presented in this figure is that for the worse possible configuration of the isochemical model, that with the *same* external polarity South–South. The resolutions of this figure and that of the preceding figure are at the foundation of the new chemical species introduced in this paper.

Due to the importance of the topic, interested scholars are encouraged to present alternative models with a proof of the impossibility for molecules to acquire a net magnetic polarity under a mostly unstable isoelectronium and/or correlations of valence electrons.

I should stress that the isoelectronium *cannot* be 100% stable and *small instabilities* must be assumed. This is due to the fact that isochemistry coincides with quantum chemistry at distances sufficiently bigger than 1 fm [3]. In particular, isochemistry preserves exchange, van der Waals and other forces of current use. In turn, the latter forces necessarily imply a small instability of the isoelectronium. The same small instability can be reached under relativistic and field theoretical treatments.

Throughout this analysis I shall therefore assume that ***in the first nonrelativistic approximation of this paper, the isoelectronium is a stable singlet state with characteristics (1.1),*** while small instabilities should be treated in future relativistic or field theoretical studies.

In this paper I cannot possibly review hadronic mechanics and chemistry to avoid an un–necessary and prohibitive length. However, the reader should be aware that a technical understanding of this paper requires a technical knowledge of hadronic mechanics at least as presented in memoir [2d], and of quantum chemistry at least as presented in Papers I, II and III [3].

Finally, in reading this paper chemists should keep in mind that I am a theoretical physicist. Therefore, the used terminology is that of physics rather than chemistry, although I have made an effort in trying to identify both terminologies for the main aspects of the analysis to render the paper accessible to both physicists and chemists.

It should be however kept in mind that the *foundations* of the new species are *purely physical,* thus rendering appropriate the use of the physics terminology. Chemistry and related terminology are expected to be appropriate in the study of the *chemical behavior* of the new species.

2. THEORETICAL PREDICTION OF MAGNECULES

2.1. Definition of magnecules. In this paper I present, apparently for the first time, the theoretical prediction permitted by hadronic mechanics [2] and chemistry [3] of the first new chemical species since the discovery of the valence bonds in the past century, where by "new species" I mean "conventional atoms and molecules bonded by a new force".

The main hypothesis is that atoms and molecules can be subjected to a new ***polarization*** of the orbits of (at least the) valence electrons, where "polarization" is intended in physics as ***the acquisition of a symmetry axis (or plane) with a fixed orientation in space*** (apparently called in chemistry the "cyclotron resonating orbit"), and the polarization is such to produce a magnetic field sufficiently strong to permit a magnetic bond stable at ordinary conditions of temperature and pressure.

The new species is submitted under the main name of ***magnecules*** and other terms based on the prefix "magne" indicating *magnetic bonds*, while the name "molecules" will be used in its conventional meaning of denoting *valence bonds*.

DEFINITION 2.1: "Magnecules" constitute a new chemical species composed by conventional neutral atoms and molecules in liquids, gases or solids under new magnetic bonds due to the polarization of the orbits of (at least the) valence electrons which is stable at ordinary conditions and possesses the following characteristics:

I) The new species should not exist under sole valence bonds, e.g., because having a molecular weight much bigger than that of the heaviest molecule of substance considered;

II) The new species is identified in mass spectrometry by new peaks not present in the same substance without magnetic polarization;

III) The new peaks result to be "unknown" in the computer search among all known conventional molecular structures;

IV) The new peaks have no infrared (for gases) or ultraviolet (for liquids) signature at all;

V) The sole infrared or ultraviolet signatures of the new peaks are those of the conventional atoms or molecules constituting the new species;

Vi) The ultraviolet or infrared signatures of conventional atoms or molecules in the new species are generally anomalous, thus indicating a deformation of their electron orbitals called "mutation";

VII) The new species has anomalous penetrations thru other substances and anomalous adhesion to other substances, generally resulting in backgrounds following mass spectroscopic measurements with major differences with the original backgrounds prior to said measurements;

VIII) Physical characteristics of the new species (specific weight, viscosity, etc.) and chemical features (thermochemical energy released or absorbed, chemical reactions, etc.) are generally different than those of the same substance without magnecules; and

IX) All the above anomalies disappear at a sufficiently high temperature (the Curie point of the new species) evidently varying from substance to substance.

Magnecules shall be called: ***elementary*** *when composed by only two molecules;* ***magneplexes*** *when entirely composed by several identical molecule; and* ***magneclusters*** *when composed by several different molecules.*

By denoting the conventional valence bond with the symbol " – " and the new magnetic bond with "× ", examples of *elementary magnecules* in gases and liquids are respectively given by

$$\{H-H\}\times\{H-H\},\{O-O\}\times\{O-C-O\},\text{ etc.,} \tag{2.1a}$$

$$\{C_{15}-H_{20}-O\times\{C_{15}-H_{20}-O\},\quad\text{etc.;} \tag{2.1b}$$

examples of *magneplexes* in gases and liquids are respectively given by

$$\{H-H\}\times\{H-H\}\times\{H-H\}\times\ldots\text{, etc.,} \tag{2.2a}$$

$$\{H-O-H\}\times\{H-O-H\}\times\ldots\text{, etc.,} \tag{2.2b}$$

and examples of *magneclusters* are given by

$$\{H-H\}\times\{C-O\}\times\{O\}\times\{O-C-O\}\times\{C\}\times\ldots\text{, etc.,} \tag{2.3a}$$

$$\{C_{13}-H_{18}-O\}\times\{C_{14}-H_{12}-O_3\}\times\{C_{15}-H_{20}-O\}\times\ldots\text{, etc.,} \tag{2.3b}$$

In this paper I shall present the theoretical prediction of magnecules and a number of independent experimental verifications for their existence at the gaseous, liquid and solid states. A number of additional independent experimental

tests on magnecules are under way and they will be presented in future works.

2.2. The magnetic origin of the new bonds. It is evident that, as a necessary condition for their existence, *any clusters of atoms and molecules requires a bonding force for their existence.*

It is equally evident that the *sole* possible forces for new bonds are either of *electric* or of *magnetic* type. In fact, all available valence electrons are used in molecules by the very conception of the new species and, therefore, they cannot contribute to any new bond (which would be conventional anyhow). The weak and strong nuclear forces should be also dismissed because they are notoriously short range. This leaves the electric and magnetic structures of atoms and molecules as the only possible origin of the new bond.

It is equally evident that the electric origin of the new bond should be dismissed for any sufficiently strong and stable new species. To begin, *the atoms and molecules constituting the new species are assumed to be neutral* (Definition 2.1). As a consequence, the sole remaining possibility via electric fields is the *electric polarization of atoms and molecules,* e.g., that resulting from deformations of the electron orbits and/or displacements of the nuclei due to external fields.

It is equally evident that such a polarization is not sufficiently stable to characterize a stable new species. In any case, simple calculations (here left to the interested reader) establish that the numerical value of electric polarizations of atoms and molecules is too small to permit any appreciable new bond.

The above occurrence establish beyond scientific doubt that the only possibility for the new species to exist is that the new bonds are of *magnetic* type.

By continuing to proceed via exclusions, the only possible magnetic moments in a conventional atom or molecule are:

1) The intrinsic magnetic moments of the valence and other electrons;

2) The intrinsic magnetic moments of the nuclei; and

3) The magnetic moments caused by the rotation of the valence (and other) electrons in their orbits.

It is easy to see that *the intrinsic magnetic moments of the electrons have no possible contribution to the new species.* In fact, according to quantum chemistry, electrons have a density distributions in all three dimensions, thus preventing a localized value of their intrinsic magnetic moments.

Moreover, according to isochemistry, valence electrons couple themselves

into the singlet isoelectronia which have identically null magnetic moments by conception, Eq. (1.1).

It is equally evident that *the intrinsic magnetic moments of nuclei cannot possibly contribute to the creation of a new species for various reasons,* such as their insufficient strength as well as their excessive distance from other atoms (on an atomic scale).

At any rate, it is known that nuclei can be readily polarized with external magnetic fields, as established in the contemporary MRI technology [4]. In the event nuclear magnetic moments would be responsible of the new species, the mere application of a magnetic field to any liquid would imply its complete reduction to one single magneclusters in dramatic disagreement with experimental evidence.

In conclusion, ***the sole possibility for the existence of the new species is that their bonds originate from the magnetic moments of the orbits of valence electrons.***

Various studies of clusters of atoms and molecules without detailed theoretical identifications and experimental verifications of the *force* responsible for their structure are rather customary in contemporary quantum chemistry, e.g., in the study of the so-called "fullerenes" [5]. This implies the possibility that the new species has already been encountered a number of times in this century, although not identified as such.

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2.3. The magnetic polarization of the orbits of valence electrons

To my knowledge, the chemical literature of this century on magnetic fields has been restricted to the intrinsic magnetic moments of nuclei and electrons [4].

Despite a rather laborious search, I have been unable to identify any study on the magnetic moments of the *orbits* of electrons in the rather vast literature of both quantum mechanics and chemistry (the indication of pre-existing studies would be gratefully appreciated for proper quotation in future works).

The magnetic moments due to orbits of valence electrons have been generally forgotten throughout this century for good reasons. In their natural state at ordinary conditions of pressure and temperature, valence electrons of all atoms have a *spherical* distributions (Fig. 2.1A) in which case no magnetic moment associated to the orbits can possibly be detected.

However, quantum electrodynamics, establishes that the rotation of any electron in a *plane* orbit does indeed create a magnetic moment according to well known laws (see next subsection).

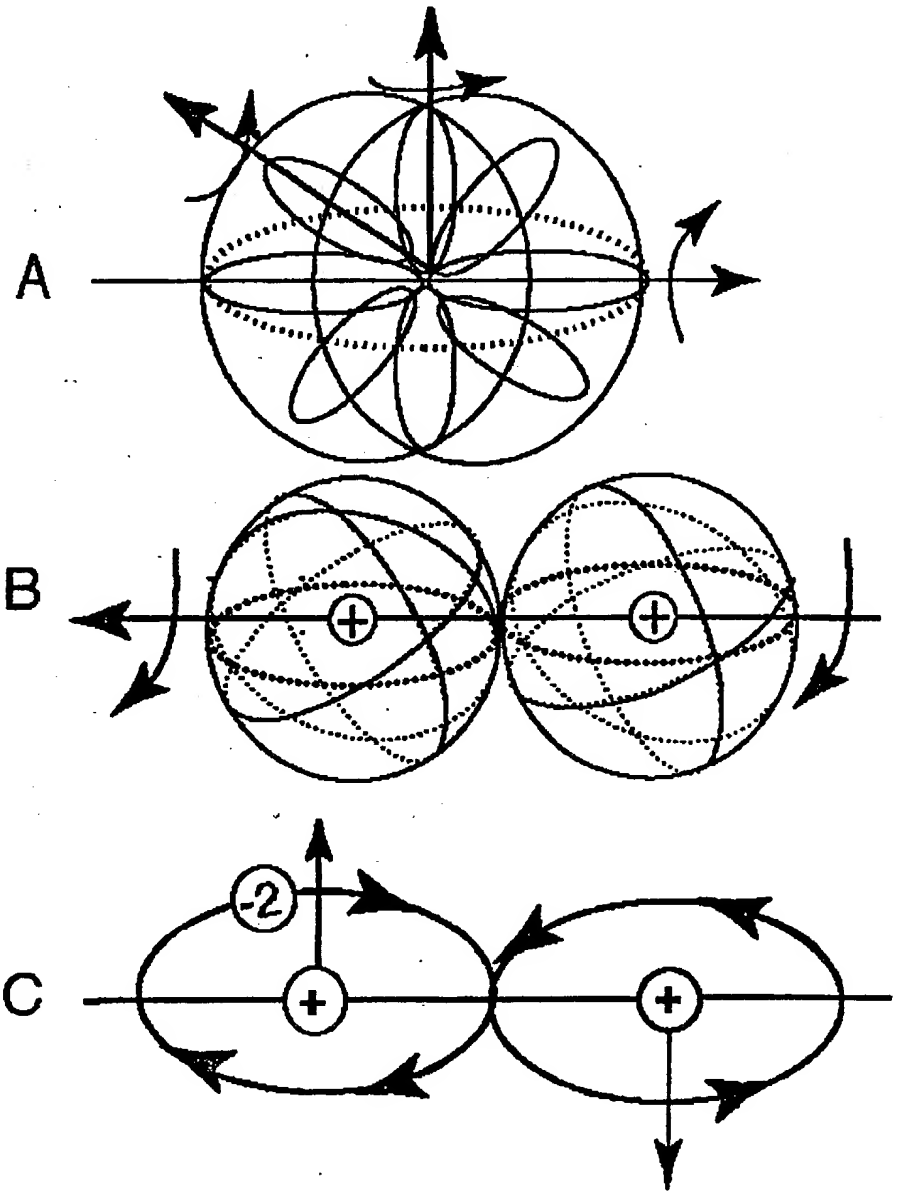

FIGURE 2.1: A schematic view of the mechanism at the foundation of the new species, the polarization of the orbits of valence electrons in a plane (cyclotron resonance orbits) here

illustrated for the case of the hydrogen molecule. As it is well known, in its natural gas state at ordinary conditions of pressure and temperature, *the hydrogen molecule is a sphere whose radius is equal to the diameter of a hydrogen atom* (Case A). A main assumption of this paper is the existence of a technology based on external magnetic fields which eliminates the rotational motions, by reaching first the configuration of Case B and then that of Case C in which the orbit of the isoelectronium is polarized in a plane. The emergence of two well defined magnetic moments is then evident. Note that I assume no new feature of the atomic structure, and merely use the manifestation of an intrinsic feature of the atomic structure.

The fundamental hypothesis I submit in this paper is therefore that ***the orbit of the valence electrons can be polarized under sufficiently strong external magnetic fields, thus manifesting in this way their magnetic moment.*** The existence of the magnecules is a mere consequence.

As we shall see in the next subsection, the value of the magnetic moment of the polarized orbits of valence electrons is much bigger than the corresponding nuclear values. However, even ignoring such numerical value, a mere observation of the elementary magnecule (2.1) indicates the close proximity of the polarized orbits of different atoms. A stable magnecule is therefore expected even for smaller values of said magnetic moment due to the strength of magnetic attraction at small distances.

I should stress that ***the polarization of the orbit of the isoelectronium in a plane is studied in this paper only at absolute zero degree temperature and in the absence of rotations or other collective motions. It is evident that at ordinary temperature the application of external magnetic fields cannot produce polarization of the orbits in a plane, but only the deformation of the spherical distribution B of Fig. 2.1 into prolate spheroidal ellipsoids.***

2.4. Theoretical representation of magnecules. By denoting with the arrow ↑ the magnetic polarity North–South and with the arrow ↓ the (vertical) polarity South–North, and by keeping the study at the absolute zero degree temperature, the main assumption of this paper is that the hydrogen molecule H–H can be polarized into such a form that the orbit of the isoelectronium is in a plane with resulting structure $H_{\uparrow}$–$H_{\downarrow}$ (Fig 1.6).

Under this assumption, elementary magnecule (2.1) has the structure (see Fig. 2.2)

$$(H_{\uparrow}^{a} - H_{\downarrow}^{b}) \times (H_{\uparrow}^{c} - H_{\downarrow}^{d}), \qquad (2.4)$$

where: a, b, c, d, are symbols merely denoting different atoms; the polarized hydrogen atom $H_{\uparrow}^{a}$ is bonded magnetically to the polarized atom $H_{\uparrow}^{b}$ with the South magnetic pole of atom a is bonded to the North pole of atom b; and the North polarity of atom c is bonded to the south polarity of atom d. This results in a strong bond due to the flat nature of the atoms, the corresponding mutual distance being very small and the magnetic force being consequently being large.

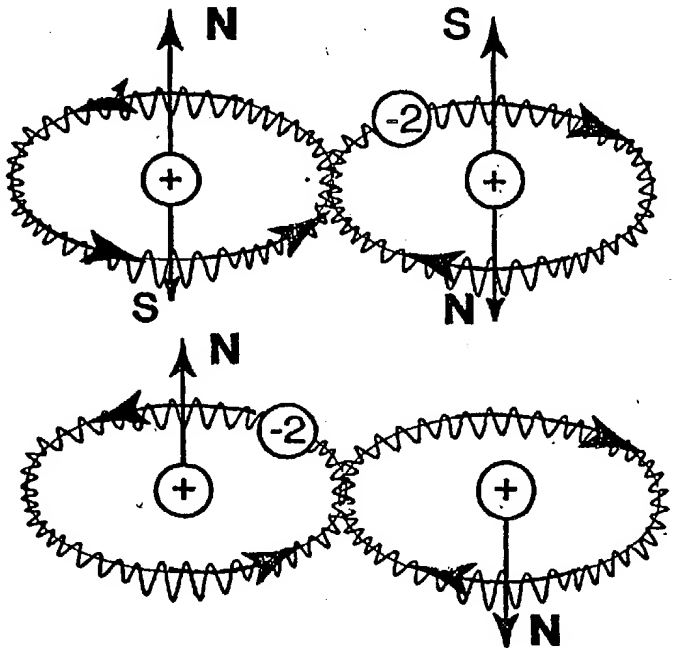

FIGURE 2.3: A schematic view of the most elementary possible gas magnecule (2.4), $[H_{\uparrow}-H_{\downarrow}]\times[H_{\uparrow}-H_{\downarrow}]$, here assumed to be formed at absolute zero degree temperature and in the absence of all collective motions. Note that the hydrogen molecule has no IR signature. Thus, the entire magnecule of this figure is therefore predicted to have no IR signature at all. Elementary magnecule (2.4) is therefore an exception to the general rule of Definition 2.1 according to which the only IR signatures of magneclusters are those of their molecular constituents. At ordinary temperature the magnecule acquires a conventional spherical shape due to rotations and other motions of the structure as a whole with comparatively ignorable relative motions between the two molecules.

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Note that, once formed, magnecule (2.4) will indeed admit rotations, vibrations, and all conventional motions due to temperature, but as a single entity, with comparatively ignorable relative motions between the two molecules due to the strength of the bond.

A structure similar to (2.4) then holds for the remaining magnecules (2.1)–(2.3). For examples, another elementary gas magnecule is characterized by the polarizations

$$\{ H_{\uparrow} - H_{\downarrow} \} \times \{ C_{\uparrow} - O_{\downarrow} \}; \tag{2.5}$$

and a generic gas magnecluster then has the structure (see Fig. 2.3)

$$\{ H_{\uparrow} - H_{\downarrow} \} \times \{ C_{\uparrow} - O_{\downarrow} \} \times \{ H_{\uparrow} - O_{\downarrow} - H \} \times \{ H_{\uparrow} - C_{\downarrow} - A - B - C \ldots \} \times \ldots \tag{2.6}$$

where A, B, C, are generic atoms in a conventional molecular chain and the atoms without an indicated magnetic polarity may indeed be polarized but are not necessarily bonded because of said geometric distribution in space.

Note that magnecule (2.4) may well have been detected several times in mass spectrometric measurements, but believed to be the helium (because its molecular weight is close to that of the helium). This case suggests that spectrometric studies of the new species should not be conducted unless the mass spectrometer (MS) is equipped with an infrared detector (IRD) for gases or ultraviolet detector (UVD) for liquids.

Recall that the hydrogen has no IR signature. Therefore, the IRD is expected to establish the *lack* of any IR signature of magnecule (2.4), while the helium has a well defined and known IR signature. Lacking the IRD in the MS instrument one may end up in the "experimental belief" that the detected peak is that of the helium, while the scientific reality may be dramatically different.

In view of the above occurrence, ***in this analysis I shall, therefore, primarily use experimental evidence based on MS data complemented with IR data for gases or UV data for liquids, and consider as nonscientific possible MS dismissal of the new species with instruments without said IRD or UVD.***

2.5. Numerical value of the magnetic moment of polarized electrons orbits. The calculation of the value of the magnetic moment of the orbits of the isoelectronium polarized in a fixed plane is truly elementary, but not

available in any book in quantum mechanics and chemistry I could inspect, as indicated earlier.

More specifically, the *laws* governing magnetic moments are well established in the literature. What is missing is their specific application to the *orbits* of the electrons beginning with that of the ground state of the hydrogen atom, let alone that for more complex atoms.

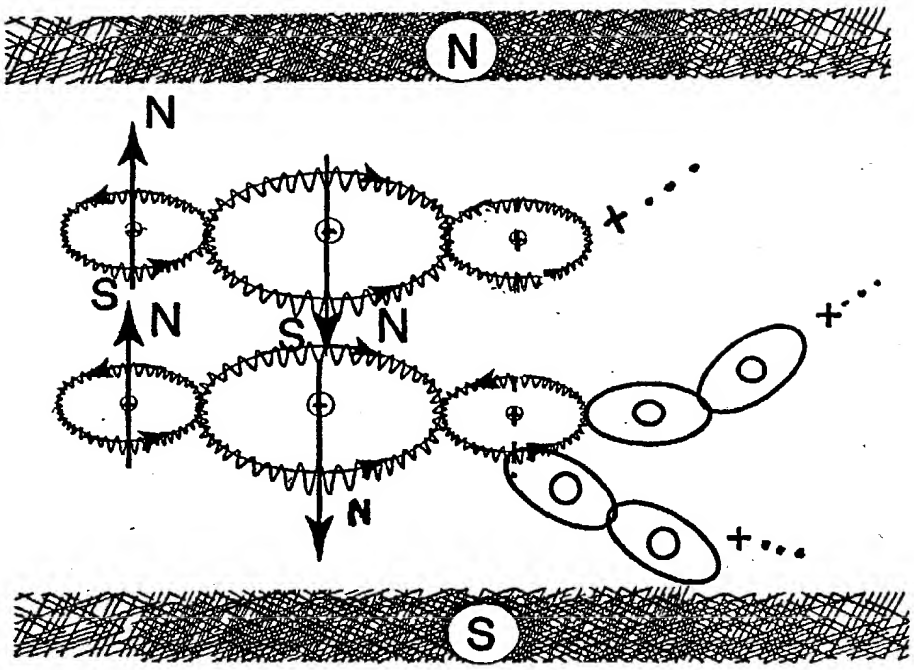

FIGURE 2.3: A schematic view of a generic magnecule (a magnecluster according to Definition 2.1) with constituent molecules in which only two dimers are magnetically bonded, while the remaining atoms of the molecules are not bonded due to their space geometry or other reasons.

By using the rationalized systems of units, the magnetic moment M of a polarized orbit of the isoelectronium is given by the general quantum mechanical

law

$$M_{isoel.} = \frac{q}{2m} L\mu , \tag{2.7}$$

where L is the angular momentum, μ is the rationalized unit and, from data (1.1), $q = -2e$ and $m = 2m_e$.

By plotting the various numerical values for the ground state of the isoelectronium in the hydrogen atom, I obtain

$$M_{isoel.} = 1,85.9590\ \mu . \tag{2.8}$$

By recalling that in the assumed units the proton has the magnetic moment 1. 4107 μ, we have the ratio

$$\frac{M_{Isoel.}}{M_{Proton}} = \frac{1,856.9590}{1.4107} = 1,316.3387 , \tag{2.9}$$

namely, ***the magnetic moment of the polarized orbit of the isoelectronium in its ground state for the hydrogen atom is 1,316 times bigger than the magnetic moment of the nucleus (the proton).***

Due to its large numerical value, result (2.9) is amply sufficient to provide the theoretical foundations for the existence of the new chemical species of magnecules.

Recall from Paper II that the ground state of the isoelectronium in the hydrogen atom is *different* than that of the electron. Despite that, the two magnetic moment coincide.

In fact, angular momenta have the structure $r \wedge p$; the orbit of the isoelectronium is expected to be 1/4 that of the electron, while its linear momentum is double in value. By plotting these data in Eq. (2.7) it follows that *the magnetic moment of the isoelectronium in its ground state polarized orbit for the hydrogen molecule as per Eq. (2.7) coincides with the magnetic moment of the ordinary electron in its own ground state in the same hydrogen atom, besides the presence in the latter case of the intrinsic magnetic moment of the electron (which must evidently follow the same polarization of the orbit)*

It then follows that ***the conventional model of the hydrogen molecule implies a total value of the magnetic moment for the polarized ground state***

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electron orbit in the hydrogen atom much bigger than the corresponding value for the isochemical model of the same molecule, due to the additional presence of the intrinsic magnetic moment of the electron.

In short, the conventional quantum chemical model of molecular bonds would predict a *bigger magnetic bond* than that predicted by hadronic chemistry. Nevertheless, this prediction will not be considered in this study due to the inconsistencies of quantum chemistry identified in Sect. 1.

Due to the conceptual, theoretical and experimental implications of Value (2.9), its independent verifications of its are solicited.

3. EXPERIMENTAL EVIDENCE OF MAGNECULES IN GASES AT TOUPS TECHNOLOGY CORPORATION.

3.1. Creation of magnecules in gases. I first proposed the existence of magnecules to, and several independent experimental verifications have been first established at the U. S. public corporation *TOUPS TECHNOLOGY LICENSING* (TTL) of Largo Florida (see the Company's Web Site [6a]). This section is devoted to an outline these developments.

During my studies on hadronic mechanics, I predicted the formation of magnecules in gases exposed to intense magnetic fields. I therefore searched for specific cases in which these conditions are met.

It was easy to see that one of the strongest, readily available sources of magnetic fields in gases is *an electric discharge*. I therefore predicted that magnecules exist in gases created by an electric discharge which are generally combustible. A similar prediction holds for liquids, as we shall see in Sect. 4.

I use the generic name of ***MagneGas*** to denote combustible gases created under or treated via a magnetic field sufficient to produce detectable magnecules. I use the term ***MagneFuel*** (or ***MagFuel*** for short) to include liquids with the same characteristics. Some of the MagneGases known to me are:

A) The gas patented by I. Eldridge in 1898 [7a];

B) The gas patented by W. A. Dammann and D. Wallman also in 1995 [7db];

C) The gas patented by W. J. Richardson, jr., in 1995 [7c] called AquaFuel^{TM};

D) The so–called Brown gas [7d] ;

E) The SkyGas [7e];

and others.

In general, an electric discharge is in a liquid essentially consisting of tap

water, carbon and other soluble substances, decomposes the water and other substances by forming a plasma at about 5,000 C of mostly ionized atoms of hydrogen, oxygen, carbon and possibly other elements which combine in a variety of ways, forming nonexplosive combustible gases with clean emission exhausts. The new gases cool down in the surrounding water, and bubble to the surface where they are collected with various means.

The main hypothesis I formulated in early 1998 is that at the time of their formation, gases H_2, CO, CO_2, O_2, etc. *do not* have a conventional structure because the orbits of (at least) their valence electrons are polarized (cyclotron resonance orbit) due to the very intense magnetic field surrounding the discharge (of the order of 10 Tesla). In turn, such a polarization implies the creation of the strong magnetic moments of Sect. 2.5, resulting a new magnetic bonds constituting the magnecules as per Definition 2.1.

While conducting these studies, I had the opportunity of visiting in early 1998 TTL where I met Mr. ***Leon Toups,*** President, Mr. ***Mark Clancy,***Mr. ***Michael Toups*** and Mr. ***Jerry Kammerer,*** Vice Presidents, Mr. ***William H. Richardson, jr.,*** Mr. ***Ken Lindfors,*** Mr. ***Jack Hansen*** and other TTL engineers.

In this way I had the opportunity of seeing the production of AquaFuel, a new, safe, clean, combustible gas under development by TTL, which is produced quite simply via an electric discharge on carbon rods within ordinary tap water.

It was evident that the electric discharge decomposes the carbon rod, and creates a high temperature plasma of mostly ionized atoms of hydrogen, oxygen and carbon. In view of their affinity, carbon combines with virtually all available oxygen, thus resulting in a nonexplosive combustible gas, essentially composed by magnetically polarized molecules H_2, CO, CO_2 and their magnetic bonds. The resulting gas has some of the cleanest exhausts available in the fuel industry (see Web Site [6b] for details).

Immediately following my visual inspection of AquaFuel, I indicated to Mr. ***Leon Toups*** and other TTL members the hypothesis that the chemical structure of AquaFuel is anomalous, that is, *not representable with quantum chemistry.* This hypothesis was fully supported by Mr. ***W. Richardson, jr.,*** because of his years of unsuccessful and frustrating attempts in trying to understand AquaFuel via conventional chemical analyses and related quantum chemistry.

In fact, several conventional mass spectrometric analyses on AquaFuel conducted at conventional high temperatures, after adjustments due to possible air contamination (indicated by nitrogen content) and averaging over various methods of production, suggested the following

Conventional chemical composition of AquaFuel:

H_2	50 %	
CO	40 %	
CO_2	9 %	(3.1)
O_2	0.2 %	
Misc. struct. in ppm	0.8 %	

However, the above chemical analysis was in dramatic disagreement with a variety of experimental evidence on AquaFuel reported in detail in Web Site [6b], such as: irreconcilable difference between the energy content of AquaFuel predicted by chemical composition (3.1) and the experimental evidence (see also Sect. 3.4); existence of large clusters in AquaFuel following filtration of light gases; numbers of octanes; and others.

I therefore conjectures that AquaFuel is indeed composed by the gases according to analysis (3.1), but all of them are magnetically polarized due to the high magnetic field of the electric discharges that produces them, thus resulting in a *new* chemical structure with generic magnecules

$$(H_\uparrow\text{–}H_\downarrow) \times (H_\uparrow\text{–}H_\downarrow)\,, \quad (C_\uparrow\text{–}O_\downarrow) \times (C_\uparrow\text{–}O_\downarrow)\,, \ (O_\uparrow\text{–}O_\downarrow) \times (O_\uparrow\text{–}O_\downarrow)\,, \text{ etc.}\,, \tag{3.2a}$$

$$(H_\uparrow\text{–}H_\downarrow) \times (H_\uparrow\text{–}H_\downarrow) \times (H_\uparrow\text{–}H_\downarrow) \times \ldots, (C_\uparrow\text{–}O_\downarrow) \times (C_\uparrow\text{–}O_\downarrow) \times (C_\uparrow\text{–}O_\downarrow) \times \ldots, \text{ etc.} \tag{3.2b}$$

$$(H_\uparrow\text{–}H_\downarrow) \times (C_\uparrow\text{–}O_\downarrow) \times H_\uparrow \times (O_\uparrow\text{–}C_{\downarrow\uparrow}\text{–}O_\downarrow) \times O_{\uparrow\uparrow} \times (O_\uparrow\text{–}O_\downarrow) \times C_{\uparrow\uparrow} \times \ldots, \text{ etc.}\,, \tag{3.2c}$$

where one should note the expected presence of individual polarized *atoms*, besides polarized molecules.

I therefore recommended to TTL the conduction on AquaFuel of comprehensive scientific measurements, such as those via suitably supervised Gas Chromatographic Mass Spectroscopic (GC–MS) equipment; energy content; octanes; permeability; etc. All these measurements were expected to be anomalous, thus providing the foundations of possible ***new technology*** on magnetically polarized gases of possible direct industrial relevance for TTL.

Mr. ***Leon Toups*** and all other TTL officers and members provided all possible financial, technical and logistic assistance for the conduction of the proposed scientific measurements which resulted to be invaluable for the achievement of the results presented in this study.

One should note the *corporate* origin of the above support for the search of basically *new* scientific knowledge, that is, knowledge beyond pre–existing

doctrines, which acquires particular significance when considering the notorious impossibility of seeking basic *new* knowledge in the contemporary academic environment.

In this section I report the experimental verifications on the existence of magnecules in AquaFuel achieved thanks to TTL support. Additional experimental verifications are under way at this writing and they will be reported in future papers.

3.2. Anomalies of magnecules to be measured. The hypothesis of magnecules in gases implies the expectation of numerous anomalies in various fields (mass spectrometry, thermochemical behavior, physical characteristics, etc.), such as:

Anomaly 3.1: Appearance of unexpected heavy MS peaks.

Gas magnecules are generally heavier than the heaviest molecule in a given gas. Peaks in the GC–MS are therefore expected in macroscopic percentages with molecular weights bigger than the heaviest molecule. These heavy composites should not provide MS peaks according to quantum chemistry, thus constituting an anomaly. As an illustration, the heaviest AquaFuel molecule in macroscopic percentages is CO_2, Eq. (3.1), which has molecular weight 44 a.m.u. By ignoring heavy compounds in parts per million (ppm), AquaFuel should have no large peak in the GC–MS with more than 44 a.m.u. The existence of heavier large peaks would establish this first anomaly.

Anomaly 3.2: "Unknown" character of the unexpected peaks.

To provide the initial premises for magnecules, the peaks of Anomaly 3.1 should result be "unknown" in the search by the GC–MS computer in its memory banks of conventional molecules, usually including about 150,000 molecules.

Anomaly 3.3: Lack of IR signature of the "unknown" peaks.

Another necessary condition to have magnecules is that the "unknown" peaks of Anomaly 3.1 should have no infrared signature at all. According to established evidence, all gases with a valence bond must have a well defined infrared signature (with a few exception of spherically symmetric molecules such as H_2). In the event the peaks of Anomaly 3.1 do have such a signature, they can be constituted by new yet conventional molecules not identified before. The only infrared signatures of any given gas magnecule should be those of the *conventional* molecules and atoms constituting the cluster itself. As an illustration, the only admissible infrared signatures of magnecule $(O_{\uparrow}–O_{\downarrow})\times(C_{\uparrow}–O_{\downarrow})$ are those of the conventional molecules O–O and C–O.

Anomaly 3.4: Mutation of conventional IR signatures.

The infrared signatures of the molecules constituting a magnecules are expected to be *mutated*, in the sense that the shape of their peaks is not the established one. This is another necessary condition for the existence of magnecules requested by the polarization of the orbits of the valence electrons. In fact, this polarization implies space distributions of the orbitals different than the conventional ones, thus resulting in a deformation of the shape of the IR peaks. Moreover, the same polarizations are expected to create additional strong bonds within a *conventional* molecule, which are expected to appear as new IR peaks. Still in turn, such an *internal mutation of conventional molecules* as far reaching scientific and technological implications, as we shall see.

Anomaly 3.5: Mutation of magnecules.

While molecules preserve their structure at conventional temperatures and pressures, this is not the case for magnecules which are expected to *mutate* in time, that is, to change the shape of the MS peaks due to change in their constituents. Since we are referring to gases whose constituents notoriously collide, magnecules can break-down during collisions into parts which can then recombine with other magnecules to form new structures. Alternatively, magnecules are expected to experience accretion (or emission) of polarized conventional atoms or molecules without necessarily breaking down into parts. It then follows that the peaks of Anomaly 3.1 are not expected to remain the same over a sufficient period of time for the same gas under the same conditions.

Anomaly 3.6: Mutated physical characteristics.

Magnetically polarized gases are expected to have mutated physical characteristics because the very notion of polarization of the orbits implies a *smaller* average molecular volume. Mutation of other physical characteristics is then consequential.

Anomaly 3.7: Increased adhesion.

Magnetically polarized gases are expected to have a increased adhesion to walls of disparate nature as compared to the same unpolarized gas. This is due to the well known property that magnetism can be propagated by induction according to which a magnetically polarized molecule with a sufficiently intense magnetic moment can induce a corresponding polarization of valence (and/or other) electrons in the atoms or molecules constituting the walls surface. Once such a polarization is created by induction, magnecules can have rather strong magnetic bonds to said walls.

Anomaly 3.8: Increased penetration through substances.

Magnetically polarized gases are expected to have absorption or penetration through other substances . This is first due to the reduction of the average

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molecular volume with inherent increase of permeability as compared to the same unpolarized gas. The second reason is the magnetic induction of the preceding anomaly.

Anomaly 3.9: Increased energy release.

Magnetically polarized gases are expected to have thermochemical reactions with macroscopic increases of energy releases as compared to the same reactions among unpolarized gases, an expected anomaly which, alone, has large scientific and industrial significance.

All the above anomalies are expected to disappear at a sufficient high temperature, evidently varying from gas to gas (Curie point), while the anomalies are expected to be enhanced at lower temperature and survive liquefaction.

Thanks to the invaluable financial, technical and logistic support by Mr. ***Leon Toups,*** TTL President, my main task in 1998 has been that of providing scientific evidence by independent laboratories for the above anomalies.

The task has been rendered difficult by the fact that most conventional analytic equipment and methods have been developed for *conventional* properties. As such, they are expected to be ineffective for the measurements of *anomalous* properties.

Evidently, Anomalies 3.1 through 3.6 should be established via GC–MS. However, most GC–MS machines are not suitable to detect magnecules, and the few that are suitable should be operated in a way significantly different than the conventional one (otherwise the magnecules would have been discovered long ago).

More specifically, the ***necessary conditions for measurements of magnecules with gas chromatographic, mass spectroscopic equipment are the following:***

Condition 3.1: The GC-MS should permit measurements of peaks at ordinary temperature (say, 10 C - 30 C) and the feeding lines should be cryogenically cooled. By comparison, GC–MS are routinely operated at temperatures of the order of 150 C to 250 C for which no magnecule is expected to exist. To put it explicitly, the conventional operation of GC–MS destroys the very clusters to be detected, and this identifies a first reason for the lack of detection of magnecules until now.

Condition 3.2: GC-MS used for measurements of magnecules should be equipped with the InfraRed Detector (IRD). In its absence,

no scientific measurement should be considered as final (because of the lack of 50% of the necessary measurements). To put this important point in plain language, measurements of magnetically polarized gases without the IRD can likely provide "experimental beliefs" without real scientific value due to "conventional interpretations" which are permitted precisely by the absence of IR data. On the contrary, data indicating the absence of IR signature for a given peak at the MS would discredit such "conventional interpretations" as nonscientific because, as indicated earlier, conventional molecules have an IR signature with only a few exception. Following a laborious search, I discovered that virtually all GC–MS in academic laboratories *are not* equipped with IRD (because academicians assume to be able to identify substances from their MS data only). This second main requirement virtually rules out the use of GC–MS in academic laboratories for the detection of the new species, and provides an additional reason why the magnecules have not been detected in academic laboratories so far. In reality, as we shall see, numerous magnecules have been indeed detected in academic laboratories, but were misinterpreted as esoteric molecules precisely because of the lack of IRD.

Condition 3.3: The GC-MS/IRD should be equipped with the largest possible feeding line with at least 0.5 mm ID. By comparison, GC–MS are usually operated with feeding lines with the smallest possible ID, at times of the order of 0.1 mm. This additional unusual requirement is due to Anomaly 3.7, i.e., the enhanced adhesion of magnecules to the walls of the feeding line which, in this way, becomes clogged up to the point of preventing the passage of the most interesting magnecules, the big magneclusters (Definition 2.1). This is another condition analysts with extended practice on *conventional* gases can only accept after being exposed to the evidence. The requirement is due to the fact that magnecules have the tendency to aggregate themselves in large clusters, some of which are so big to be visible to the naked eye (particularly in liquids, as shown in the next section). The use of the smallest possible feeding line, while fully acceptable for conventional gases, generally prevents the most interesting magnecules to even enter the instrument, let alone to be detected.

Condition 3.4: The GC-MS should be set to detect peaks at molecular weights where the analyst usually expects none. This condition identifies another reason why magnecules have simply not been looked for until now. As an illustration, the most interesting molecular weights for AquaFuel are those *bigger* than their heaviest conventional molecule, i.e., bigger than 44 a.m.u. It goes without saying that smaller molecular weights are also

important once the analyst *seeks an anomaly*, rather than a conventional setting. In fact, one of the most important magnecules is structure (2.4) at about 4 a.m.u composed by two hydrogen molecules.

Condition 3.5: The ramp time should be the longest admitted by the GC-MS/IRD and of at least 25 minutes. In general, for the evident reason to reduce costs, the ramp time is set at the smallest possible operational value, which is perfectly acceptable for conventional gases, but substantially inappropriate for the anomalies we have to detect. As we shall soon see, for the case of magnetically polarized gases a small ramp time implies the clustering of all magnecules into one single peak. The analyst then looks at each individual constituent of such a unique large peak and find fully conventional molecules, thus reaching the "experimental belief" of facing a conventional molecular structure. For a sufficiently large ramp time the magnecules are instead well separated, thus permitting the analyst to see their individual existence and therefore establish their individual lack of the valence structure via MS and IR data.

Numerous other conditions exist for GC–MS/IRD to be effective in the detection and identification of magnecules. They are of more technical nature and will be indicated whenever needed.

Besides the problems in identifying an appropriate GC–MS/IRD, I experienced additional difficulties in the identification of other instruments capable of providing effective measurements of the other Anomalies 3.7–3.–3.9, again, because the available instruments have been designed for the measurement of *conventional* rather than anomalous features.

As an illustration, by far the most difficult measurement of AquaFuel features has been the achievement of credible scientific values of its energy content in British Thermal Units (BTU) per cubic foot (cf). By comparison, the measurement of the BTU/cf of ordinary gases is so elementary nowadays to be computerized following GC–MS data.

Significantly, *all* methods currently available to measure the BTU/CF of AquaFuel failed to provide results of any credibility (this is the case of computerized computation of BTU/cf from GC–MS results) and some conventional calorimeters did not even allow AquaFuel to burn, let alone to make a measurement (this is the case of the computerized calorimeters for methane whose air intake is too big for the combustion of AquaFuel and its required adjustment outside the range of the computer program).

Equal difficulties were encountered via the use of EPA analytic techniques,

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evidently because they are not designed to detect anomalies.

3.3. Spectroscopic evidence of magnecules in gases. After a laborious search in the U.S.A., I located a GC–MS equipped with IRD suitable to measure magneclusters at the ***McClellan Air Force Base*** in North Highland, near Sacramento, California. Thanks to the invaluable assistance and backing by TTL, I was authorized to conduct GC–MS/IRD measurement on AquaFuel at that facility.

Following the prior arrival of a bottle of AquaFuel, on June 19, 1998, I visited the analytic laboratory of *NATIONAL TECHNICAL SYSTEMS* (NTS) located at said McClellan Air Force Base. The measurements on AquaFuel were conducted by analysts ***Louis A. Dee,*** Branch Manager, and ***Norman Wade*** who operated an HP GC model 5890, an HP MS model 5972, and an HP IRD model 5965. Upon inspection, the instrument meet all conditions 1–5 of Sect. 3.2. I therefore authorized the measurements.

Thanks to a professional cooperation by the analysts, the equipment was set at all the unusual conditions indicated in Sects. 3.2. In particular, the equipment was set for the analytic method VOC IRMS.M utilizing an HP Ultra 2 column 25 m long with a 0.32 mm ID and a film thickness of 0.52μm. I also requested to conduct the analysis from 40 a.m.u. to the instrument limit of 500 a.m.u. This condition was necessary to avoid the CO peak of AquaFuel at 28 a.m.u. which is so large to dwarf all other peaks.

Moreover, the equipment was set at the lowest possible temperature of 10 C; the biggest possible feeding line with an ID of .5 mm was installed; the feeding line itself was cryogenically cooled; the equipment was set at the longest possible ramp time of 26 minutes; and a linear flow velocity of 50 cm/sec was selected. A number of other technical requirements are available in the complete documentation of the measurements reproduced in App. A of Ref. [3e].

The analysts first secured a documentation of the background of the instrument prior to any injection of AquaFuel in view of Anomaly 3.7 which is evidently expected to alter the background due to anomalous residues of the AquaFuel in the instrument after the completion of the tests.

Following a final control that *all* requested conditions were in place, NTS analysts ***Louis A. Dee*** and ***Norman Wade*** injected AquaFuel into the HP GC–MS/IRD and initiated the tests.

As one can see, the results constitute the first direct experimental evidence on the existence of magnecules.

After waiting for the 26 minutes of the ramp time, ***sixteen heavy anomalous***

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peaks appeared in the MS screen, thus providing direct experimental verification of Anomaly 3.1 (Fig. 3.1).

AquaFuel contains from 5% to 7% of CO_2 as per various chemical analyses conducted at high temperature [6b]. The spectrum of Fig. 3.1 is from 40 a.m.u. to 500 a.m.u. Comparative inspection of the various peaks and their size then establishes that they represent macroscopic percentages of compounds in AquaFuel which, according to quantum chemistry, should not exist, thus providing experimental evidence for Anomaly 3.1 beyond scientific doubt.

I should report that, at the appearance of the peaks of Fig. 3.1, analyst ***Norman Wade*** stated "I have not seen something like these peaks in twenty five years of analyses".

The analysts then passed to the identification of the individual peaks of Fig. 3.1. As illustrated in Fig. 3.2 (see the complete documentation of Ref. [3e] for more data), ***all sixteen peaks of Fig. 3.1 resulted to be "unknown" following the computer search in the memory banks of the McClellan Air Force Base comprising about 140,000 molecules, thus providing direct experimental verification of Anomaly 3.2.***

After completing and documenting the MS data, the analysts passed to measurements at the IRD. To their surprise, ***none of the peaks of Fig. 3.1 had any infrared signature at all, thus providing direct experimental verification of Anomaly 3.3*** (Fig. 3.3). The IR scan for the MS peaks of Fig. 3.1 only shows a peak clearly belonging to CO_2, namely, to one of the *components* of the peaks of Fig. 3.1. The IR signature of the other components do not appear in Fig. 3.3 because they are behind the left margin of the scan. Note also that there is no identifiable CO_2 peak in the MS spectrum of Fig. 3.1.

The analysts then established (Fig. 3.4) that ***the IR peak of CO_2 is itself anomalous (mutated), thus providing experimental evidence for Anomaly 3.4.***

This result is most intriguing inasmuch as it provides ***experimental evidence for a mutation of the structure of conventional molecules with the presence of an additional strong internal binding force also expected to be of magnetic type which, in turn, is expected to imply an increased energy content.***

To appraise the implication of this aspect alone, one should meditate a moment on the fact that it provides ***experimental evidence on the polarization of the orbits of internal non-valence electrons***, evidently because valence electrons cannot provide any additional molecular bond for both conventional and hadronic chemistry.

The analysts also inspected small peaks in the IR scan, and they all resulted to be "unknown", as shown in Fig. 3.5, thus completing the experimental evidence

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of the anomalous IR behavior.

Following the measurements, I received the following signed report dated June 23, 1998 (see the original in App. I of Ref. [3f]):

"Dear Dr. Santilli,

Thank you for the opportunity to provide analytic data on AquaFuel™. Attached are all GC-MS and concomitant GC-IR data that we obtained for the unfiltered sample.

... Our blank runs obtained before and after the analyses show no high mass spectra, thus proving that the high molecular weight species found were actually in the AquaFuel™ sample.

.... Search results using a library of 138,000 chemical compounds, did not indicate any matches with this high molecular weight species found in AquaFuel™.

Based on the limitations of our equipment and our inability to find a library match, the identification of this mysterious AquaFuel™ ingredient is an unknown."

National Technical Systems
Louis A. Dee
Branch Manager"

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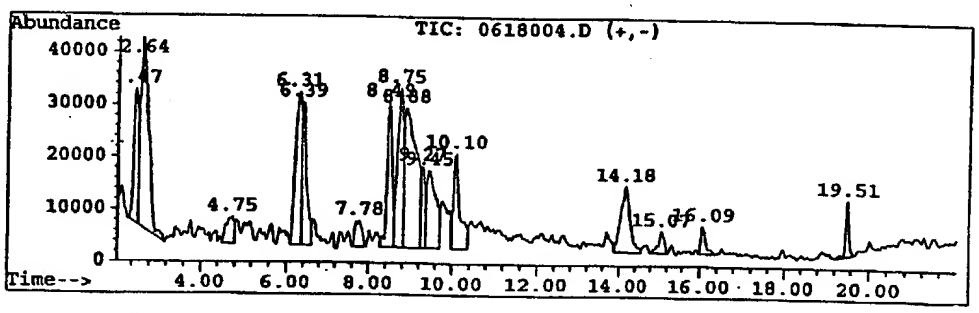
```
Information from Data File:
File       : C:\HPCHEM\1\DATA\0618004.D
Operator   : NAW
Acquired   : 18 Jun 98   3:01 pm using AcqMethod VOC_IRMS
Sample Name: TOUP'S TECH
Misc Info  : 1ML LOOP; 10C @ ULTRA COLUMN
Vial Number: 1
CurrentMeth: C:\HPCHEM\1\METHODS\DEFAULT.M
```



Retention Time	Area	Area %	Ratio %
Total Ion Chromatogram			
2.474	1753306	5.386	32.724
2.644	5091514	15.641	95.030
4.754	641528	1.971	11.974
6.307	2737749	8.411	51.098
6.390	2211258	6.793	41.272
7.782	592472	1.820	11.058
8.490	2357396	7.242	43.999
8.754	2784829	8.555	51.977
8.882	5357812	16.460	100.000
9.265	1123809	3.452	20.975
9.448	2421234	7.438	45.191
10.098	1946292	5.979	36.326
14.177	2129791	6.543	39.751
15.073	435208	1.337	8.123
16.085	389822	1.198	7.276
19.509	577433	1.774	10.777

FIGURE 3.1: A reproduction of the MS peaks providing the ***first experimental evidence on the existence of magnecules*** identified on June 19, 1998, by analysts ***Louis A. Dee*** and ***Norman Wade*** of the branch of *NATIONAL TECHNICAL SYSTEMS* (NTS) located at the *MCCLELLAN AIR FORCE BASE* in North Highland, near Sacramento, California, under support from *TOUPS TECHNOLOGY LICENSING* (TTL) of Largo, Florida. The peaks refer to the combustible gas *AquaFuel*^{TM} under development by TTL, for molecular weights ranging from 40 a.m.u. to 500 a.m.u. AquaFuel is a *light* gas with only

CO_2 as the heaviest molecule in macroscopic percentage with a molecular weight over 40 a.m.u. [6]. Therefore, *only* the CO_2 peak should have appeared in the scan with any macroscopic size. On the contrary, the CO_2 peal is not identifiable at all in the scan; *all* sixteen peaks should not be present according to quantum chemistry; and the scan therefore provides the first direct experimental confirmation of Anomaly 3.1.

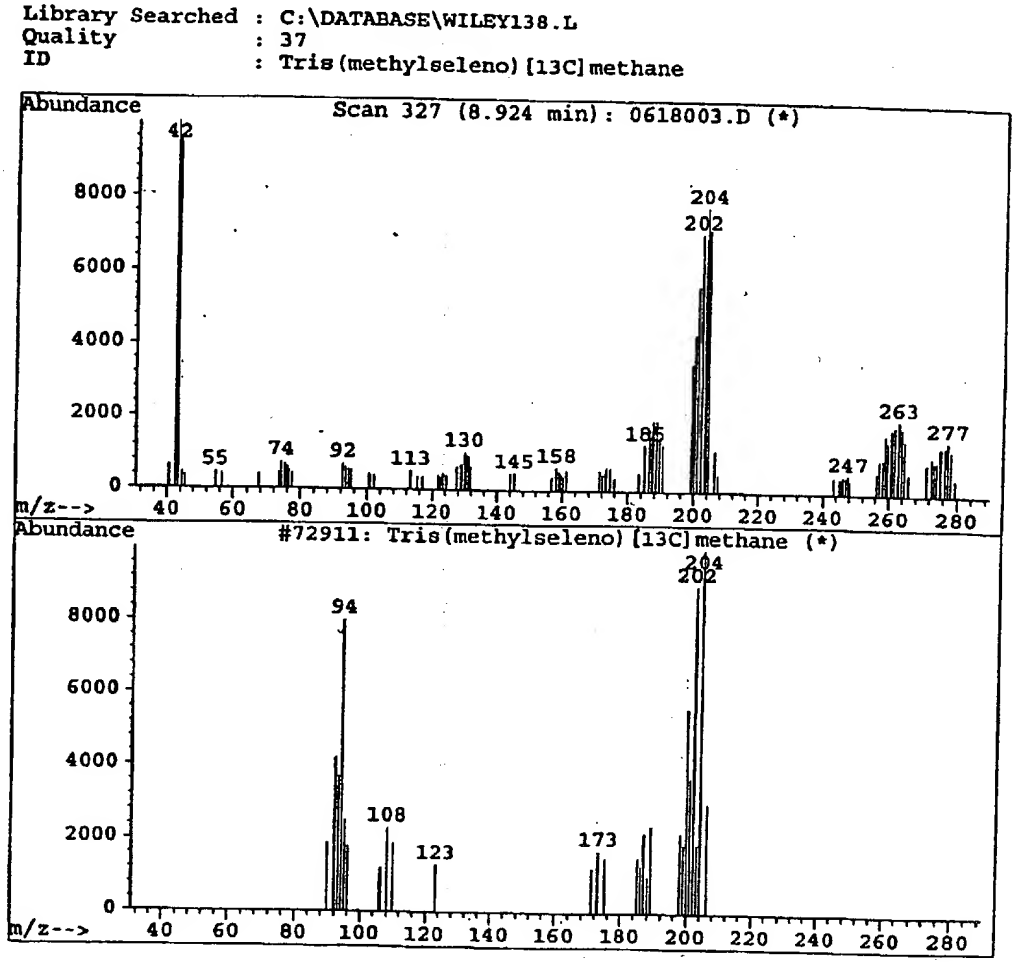


FIGURE 3.2: ***The first experimental evidence at NTS that the peaks of Fig. 3.1 are "unknown"***. The peak at the top is that at 8.924 minutes and that at the bottom shows the lack of its identification by the computer search. Note that, not only the best fit identified by the computer does not match the peak considered, but also the identified

substance (methylseleno) cannot possibly exist in AquaFuel because of the impossible presence of the necessary elements. Exactly the same situation holds for all remaining fifteen peaks of Fig. 3.1 (see the complete documentation in Ref. [3f]) which, therefore, remained "unknown", thus providing the first direct experimental verification of Anomaly 3.2.

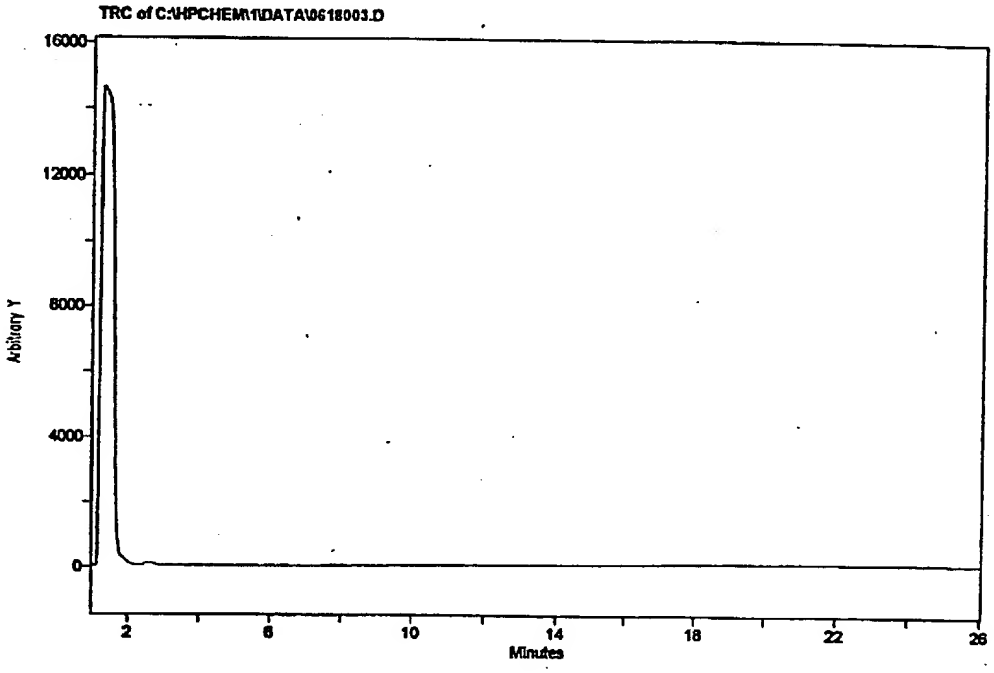


FIGURE 3.3: ***The first experimental evidence at NTS on the lack of IR signature of molecules,*** which establishes the existence of large peaks in the MS which have no IR signature at all. This provided the first direct experimental verification of Anomaly 3.3. The only IR signatures which are possible in AquaFuel are those for the *constituents* of the peaks of Fig. 3.1 which are ordinary gases such as O_2, CO, and CO_2. In the above figure only the IR signature of CO_2 appears because the scan was from 40 a.m.u. to 500 a.m.u. and, as such, could not include the IR signatures for O_2 and CO (H_2 has no IR signature).

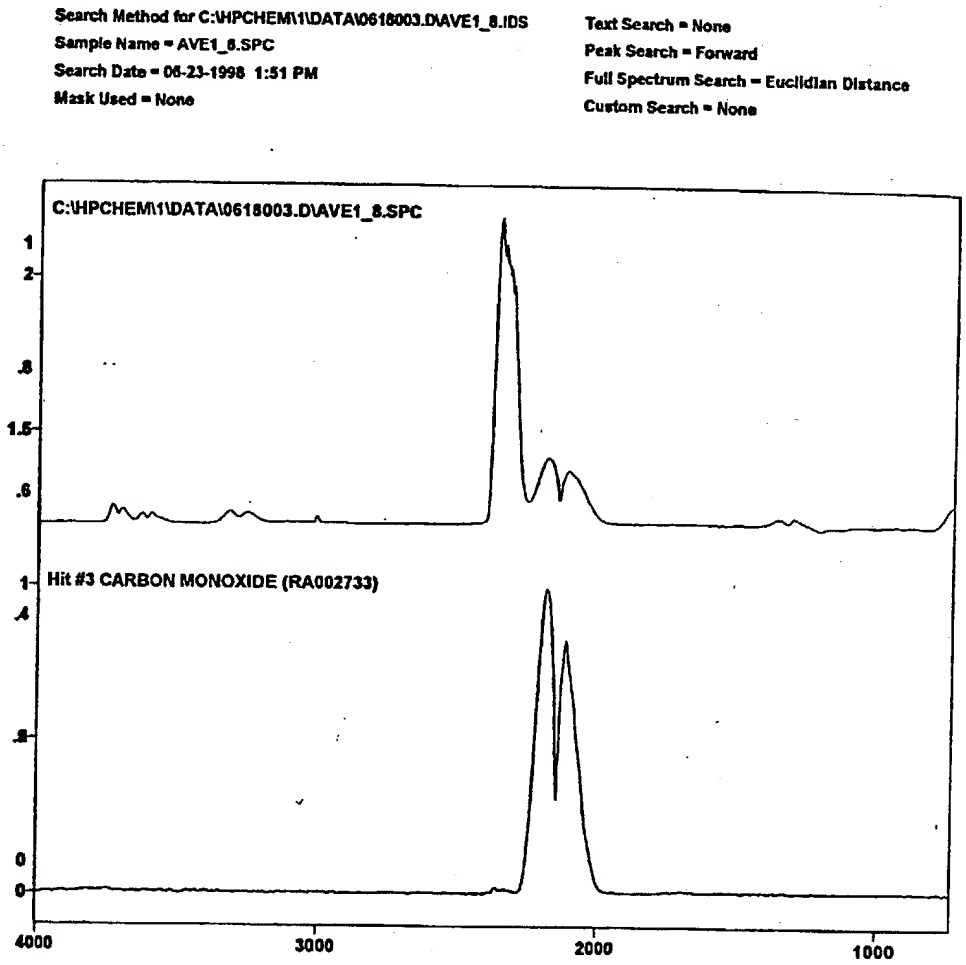


FIGURE 3.4: ***The first experimental evidence at NTS on the mutation of the IR signature of magnetically polarized conventional molecules,*** here referring to the CO_2 (top) compared to the conventional one (bottom). This provides the first direct experimental verification of Anomaly 3.4, namely, that *conventional* molecules composing AquaFuel have a deformed space distribution of their electrons, as necessary to have a polarization of their orbits. In turn, such deformations imply a necessary mutation of the IR signature. Note that the known, double–lobe PQR peak of CO_2 persists in the detected peak with the correct energy, and only with decreased intensity. Jointly, there is the appearance of a *new peak at higher energies on the left* which is

Jointly, there is the appearance of a *new peak at higher energies on the left* which is evidence of an extremely interesting *new internal bond within the conventional CO_2 molecule*, which evidently implies an increased energy content, thus establishing experimental foundations for a new technology of magnetically polarized gases with enhanced energy content (see Sect. 3.4). ***Note that the computer interprets the IR signature as belonging to CO which is erroneous since CO is out of the selected range. The signature is instead that of CO_2 as confirmed in subsequent tests (see Fig. 3.8).***

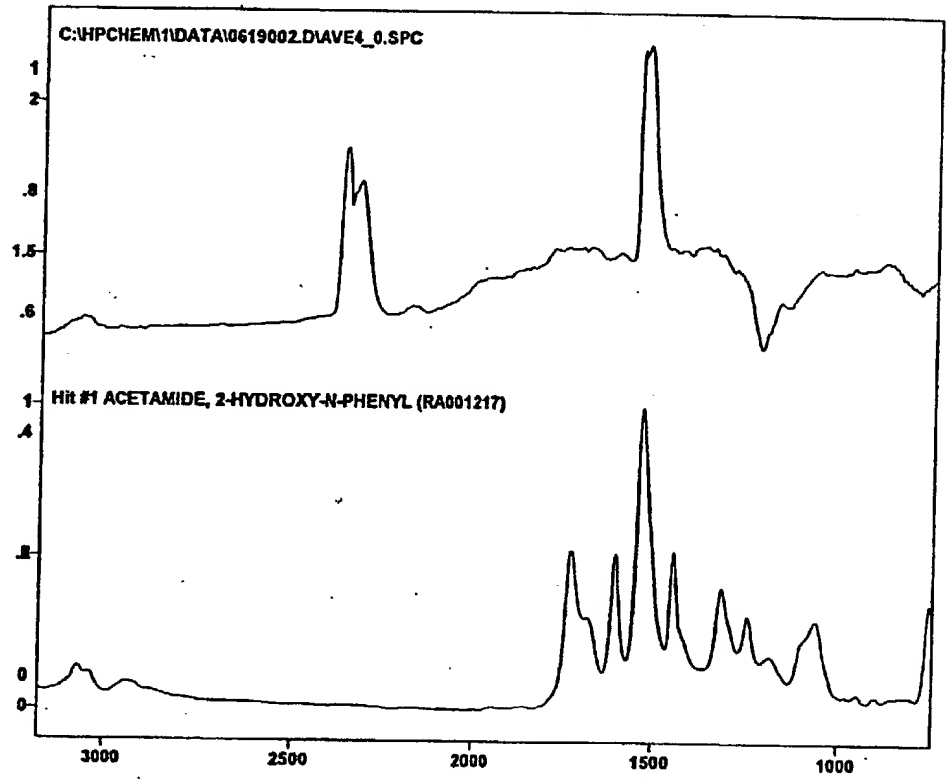


FIGURE 3.5: A reproduction of the lack of identification in the computer search of small peaks in the IR scan. The best possible match offered by the computer (lower peak) does not even partially recover the detected IR peak (top). At any rate, the suggested substance (Acetamide) cannot possibly exist in AquaFuel because of the lack of the necessary elements. All other smaller IR peaks remained equally unknown.

The measurements on the same sample of AquaFuel tested at NTS were repeated on July 25, 1998, by analyst ***Kevin Lothridge*** via a GC–MS/IRD located at the *PINELLAS COUNTY FORENSIC LABORATORY* (PCFL) of Largo, Florida, under TTL support (for complete documentation see App. II of Ref. [3f]).

The equipment consisted of an HP GC model 5890 Series II, an HP MS model 5970 and an HP IRD model 5965B. Even though similar to the equipment used at NTS, the PCFL equipment was significantly different inasmuch as the temperature had to be increased from 10 C to 55 C and the ramp time reduced from 26 minutes to 1 minute. The latter reduction implied the cramping of all peaks of Figure 3.1 into one single large peak, a feature confirmed by all subsequent GC–MS tests with short ramp time.

Despite these differences, the test at PCFL confirmed *all* Anomalies 3.1–3.4 first detected at NTS (see Figs. 3.6, 3.7, 3.8 and the complete documentation reproduced in Appendix B of Ref. [3e]). In addition, the tests provided the first experimental evidence of additional anomalies.

Following my request, analyst ***Kevin Lothridge*** conducted *two* MS tests of the *same* AquaFuel sample at *different times* about 30 minutes apart. As one can see in Fig. 3.9, ***the test at PCFL provided the first experimental evidence of Anomaly 3.5, the mutation in time of magnecules.*** In fact, the peak of Fig. 3.9 is macroscopically different than that of Fig. 3.6.

This provided evidence that, when colliding, magnecules can break down into ordinary molecules, atoms and fragments of magneclusters, which then recombine with other molecules, atoms and/or magnecules to form new unknown peaks. Equivalently, the experimental evidence establishes the expectation that mutation of magnecules can simply occur via the accretion of release of another polarized atoms or molecule without breaking down.

As one can see in Fig. 3.10, the tests conducted by analyst ***Kevin Lothridge*** also provided ***the first experimental evidence that the background following the end of the measurements resulted to be significantly similar to the MS scan, thus providing a direct experimental verification of Anomaly 3.7 on the increased adhesion of magnecules.***

The original background prior to the measurements with AquaFuel was re–obtained only after flushing the instrument with an inert gas at about 250 C. Such flushing heated the interior walls and parts of the instrument, thus breaking down all magnecules, terminating their anomalous adhesion and re–establishing their conventional molecular structure.

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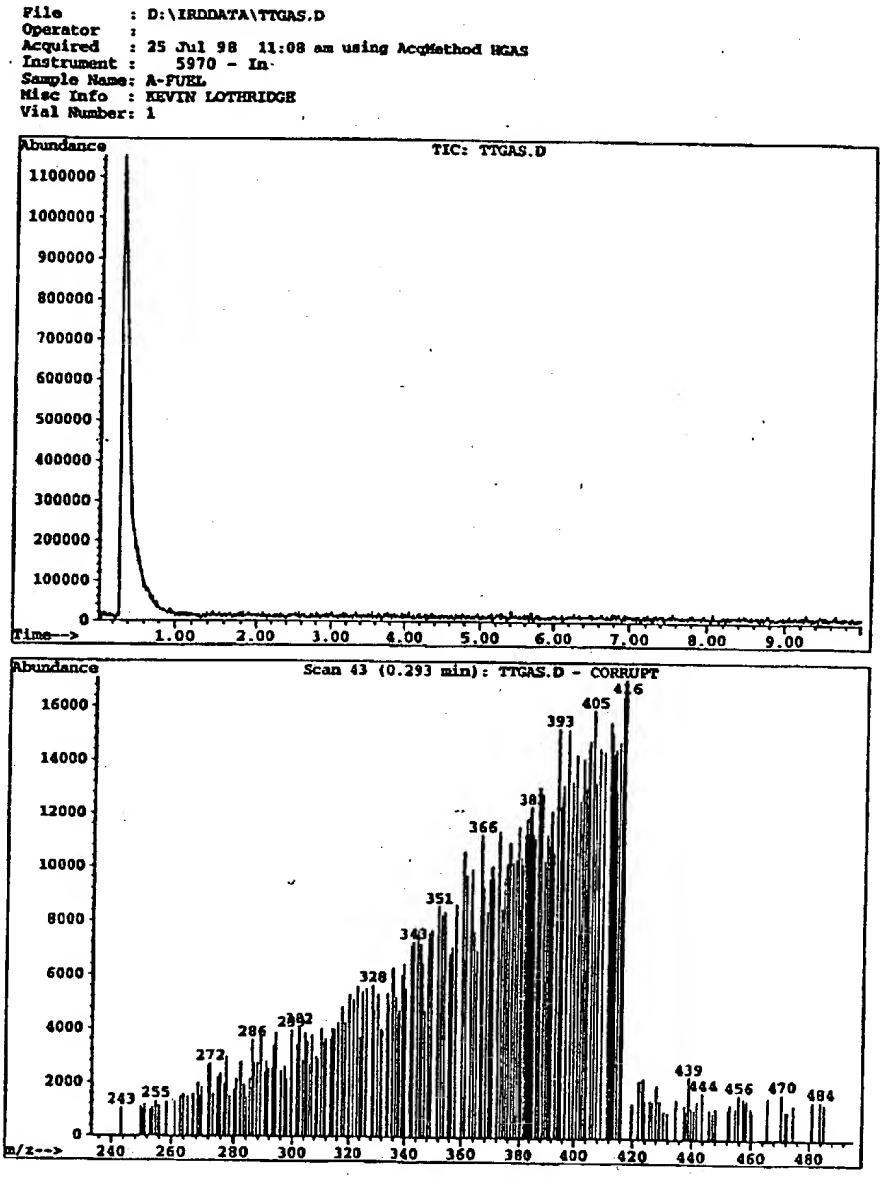

FIGURE 3.6. A view of the IRD scan (top) and MS spectrum (below) of AquaFuel conducted by analyst ***Kevin Lothridge*** on July 25, 1998, via a HP GC-MS/IRD located at the *PINELLAS COUNTY FORENSIC LABORATORY* (PCFL) of Largo, Florida, under support from *TOUPS TECHNOLOGY LICENCING* (TTL) also of Largo, Florida. As one can see, the scan confirms the anomalous peaks of Fig. 3.1 obtained at NTS which are clustered into

the single peak (bottom part of the above figure) due to the excessively short ramp time of 1 minute. The scan also confirms the results of Fig. 3.3 obtained by NTS on a crucial anomaly of magnecules, their lack of IR signature (top part of the figure). Note that, exactly as it was the case for the NTS measurements, the only IR signature is that of the CO_2 which does not appear in the MS scan as an isolated identifiable peak even though it is contained in AquaFuel for about 9 %.

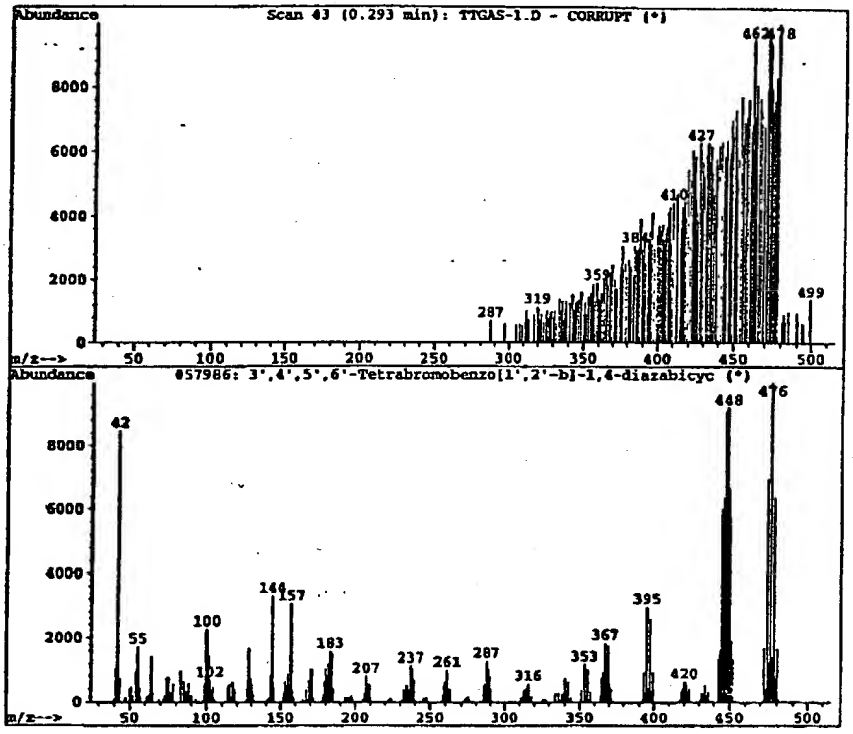

FIGURE 3.7: A confirmation at the PCFL of the NTS result of Fig. 3.2, the lack of identification by the computer search of the peaks in the MS (see App. II of Ref. [3f] for the complete documentation). Again, the substance selected by the computer as the best match (bottom) does not even approach the detected peak (top), besides being impossible for AquaFuel because of the lack of needed elements.

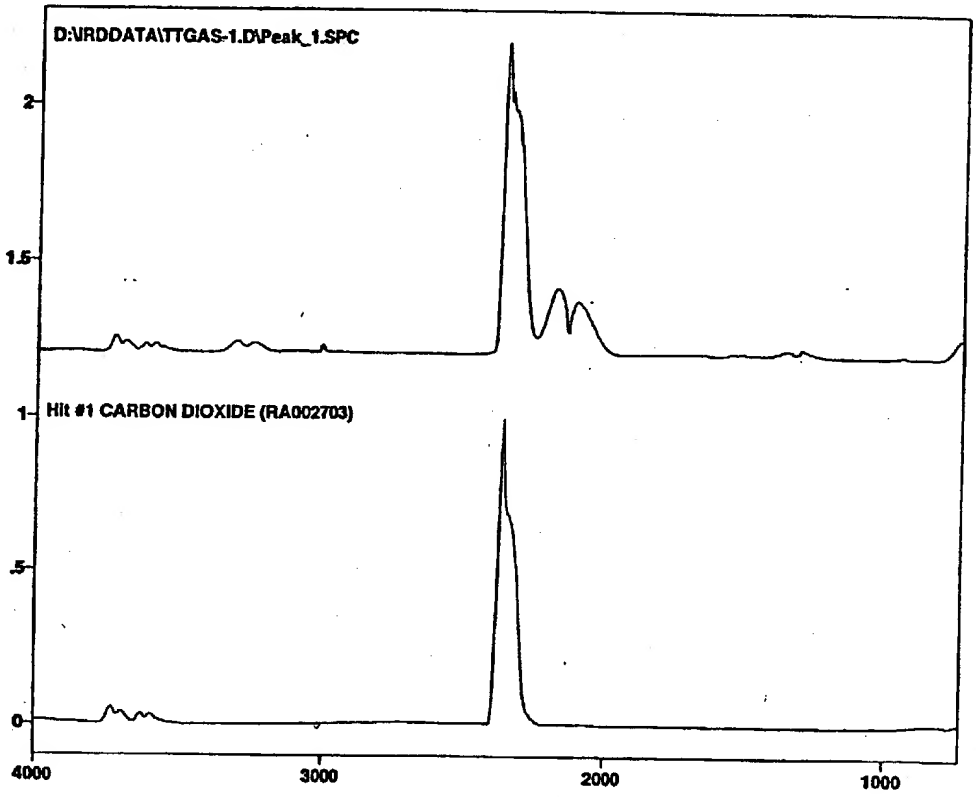

FIGURE 3.8: The independent confirmation at the PCFL of the NTS finding of Fig. 3.4 regarding the mutated IR signature of the CO_2 in AquaFuel. Note the identical shapes of the mutated IR peak in the top of the above figure and that in Fig. 3.4 obtained via a different instrument. Note the appearance again of two new peaks in the IR signature of CO_2, which indicate the presence of *new bonds* not present in the *conventional* molecule. The only interpretation known at this writing is that the intense magnetic field cause polarization of the orbits of internal non-valence electrons which, in turn, create internal new bonds of magnetic type. This is the only known interpretation of *the capability of the new technology of magnetically polarized gases of storing anomalous amounts of energy within conventional magnecules prior to or in addition to their magnetic bonds to other magnetically polarized molecules.*

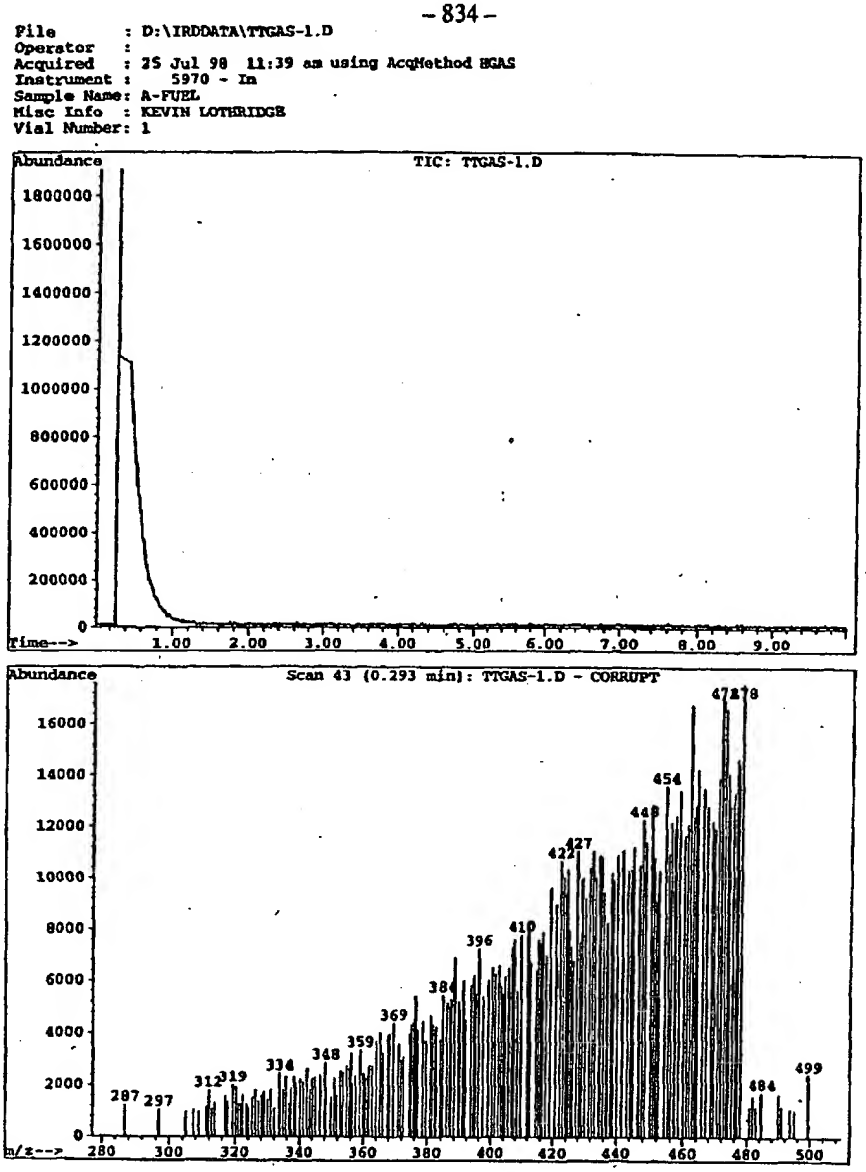

FIGURE 3.9: The first direct experimental verification of Anomaly 3.5 obtained by analyst ***Kevin Lothridge*** at the PCFL on July 25, 1998, on the mutation in time of the magnecules constituting AquaFuel. The MS peak of this figure is macroscopically different than that of Fig. 3.6, despite the fact that they refer to the *same gas* (without even removing the bottle from the feeding line), only scanned 30 minutes apart.

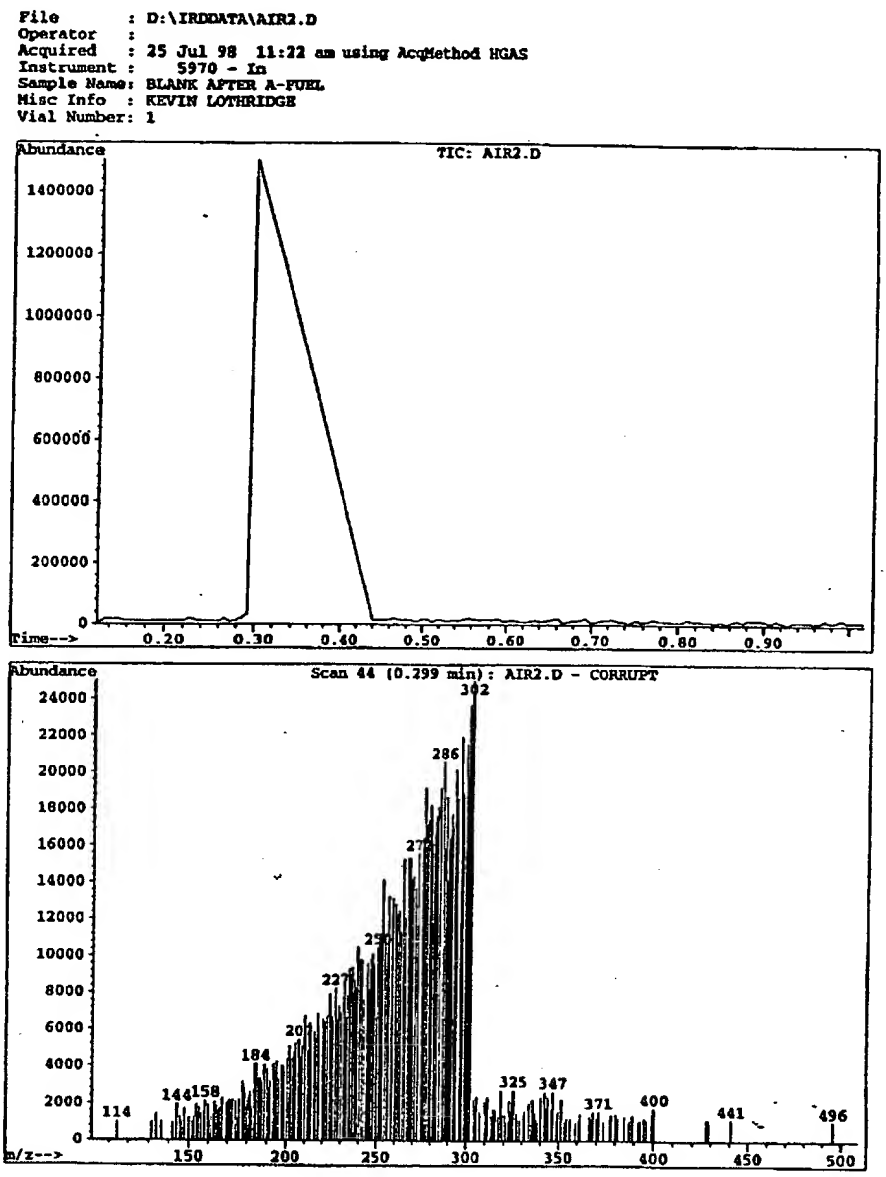

FIGURE 3.10: The first direct experimental verification of Anomaly 3.7 obtained at the PCFL, the increased adhesion of magnecules. The figure reproduces the background of the instrument upon completion of the measurements and removal of AquaFuel. Nevertheless, the background results to be very similar to the MS scan during the tests, thus establishing that part of the gas had remained in the interior of the instrument. This behavior can only

be explained via the induced magnetic polarization of the atoms and molecules in the walls and parts of the instrument with consequential increased adhesion via magnetic bonds. It should be noted that this anomalous adhesion has been confirmed by all subsequent tests for both the gaseous and liquid states.

A third independent verification was conducted on July 29, 1998, by analyst ***David Fries*** at the *CENTER FOR OCEAN TECHNOLOGY* of the *UNIVERSITY OF SOUTH FLORIDA* (USF) in St. Petersburg, under TTL support. The test were done via the use of a GC-MS Barian 2000 in which the GGC had been removed and replaced by a modified Paul's Trap which turned the instrument into a Ion Trap Mass Spectrometer (IT-MS).

Since the equipment belongs to an academic laboratory, it was not equipped with an IRD. This is unfortunate for scientific knowledge because Paul's Trap is based on a locally strong magnetic field which, as such, is expected to polarize all conventional molecules (although in an amount evidently less than the extreme magnetic fields of a large electric discharge).

In fact, the background of the instrument prior to the initiation of measurements showed various peaks which were tentatively identified as conventional molecules. The presence of an IRD would have evidently permitted the separation of science from personal beliefs.

In fact, only the additional presence and use of an IRD would have permitted the scientific identification with only two possibilities: the IR signatures of the peaks in the background are indeed those of the believed conventional molecules; or said peaks have no IR signature at all, in which case they cannot possibly be conventional molecules, because consisting of smaller molecules under the new magnetic bond.

As one can see in the following figure 3.11-3.21 (see Appendix III of Ref. [3f] for the complete documentation), despite the lack of IRD, the measurements provided a third independent verification of *all* preceding experimental evidence on the existence of magnecules.

Moreover, ***the USF measurements established the existence in the AquaFuel magnecules of individual hydrogen atoms, due to the accretion or loss by various peaks of only one hydrogen atom due to variations of only one a.m.u.*** This result was expected because of the known high sensitivity of Paul's Trap. The presence in the AquaFuel magnecules of other individual atoms (such as C or O) is implies in the preceding NTS and PCFL measurements, although it is best established for the case of the hydrogen.

In view of the above occurrence, inspection of the various MS scans

indicates ***the absence in magnecules of systematic numerical periodicities,*** e.g., their systematic increase with periodicity two (sole accretion of H_2 molecules), or thirty-eight (sole accretion of CO molecules).

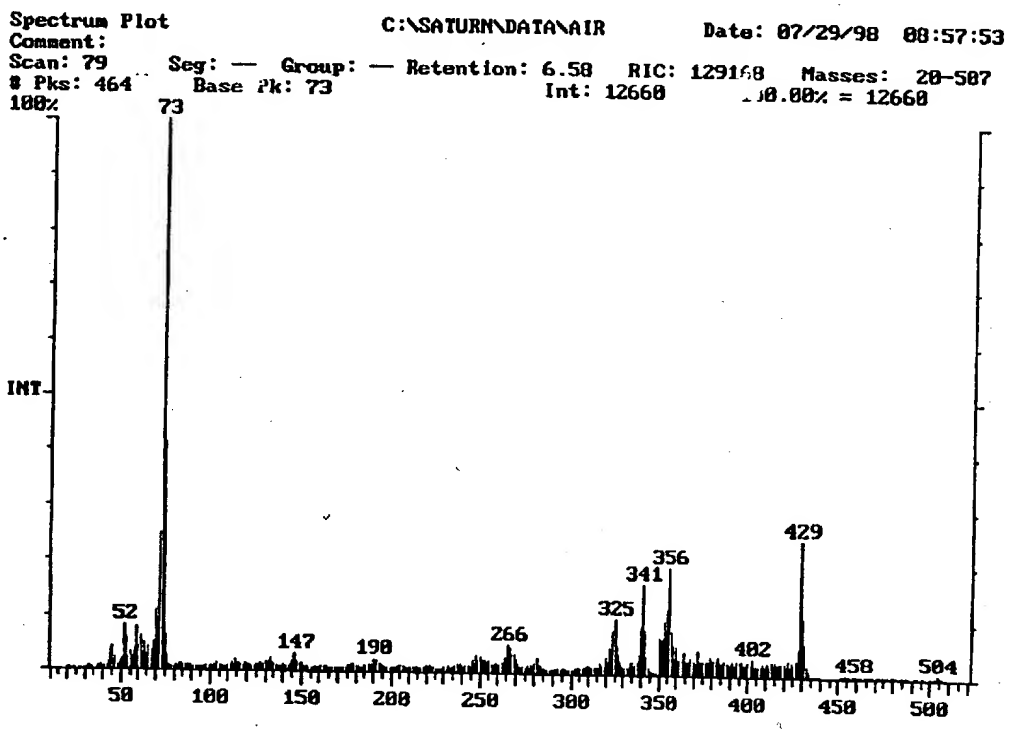

FIGURE 3.11: Scan 79 of the tests conducted on AquaFuel on July 29, 1998, by analyst ***David Fries*** at the *CENTER FOR OCEAN TECHNOLOGIES* of the *UNIVERSITY OF SOUTH FLORIDA* (USF) in St. Petersburg, under support by *TOUPS TECHNOLOGY LICENSING* (TTL) of Largo, Florida. A mere visual inspection of the peaks provides additional direct experimental verifications of Anomaly 3.1 as first established by the NTS data of in Fig. 3.1.

AquaFuel is a *light* gas with about 49% H_2, 40% CO, 9% CO_2, 1% of O_2, and 1% of traces of various heavier substances based on H, O and C individually in ppm. The very existence of the dominant large peak at 73 a.m.u. is unequivocal experimental confirmation of Anomaly 3.1. The large peaks at 246, 325, 341, 356 and 429 a.m.u. then confirm the above evidence beyond credible doubt. Needless to say, there are countless conventional substances having 73 a.m.u., but none of them is possible in a gas composed by H, O and C and created at about about 5,000 C of the electric discharge.

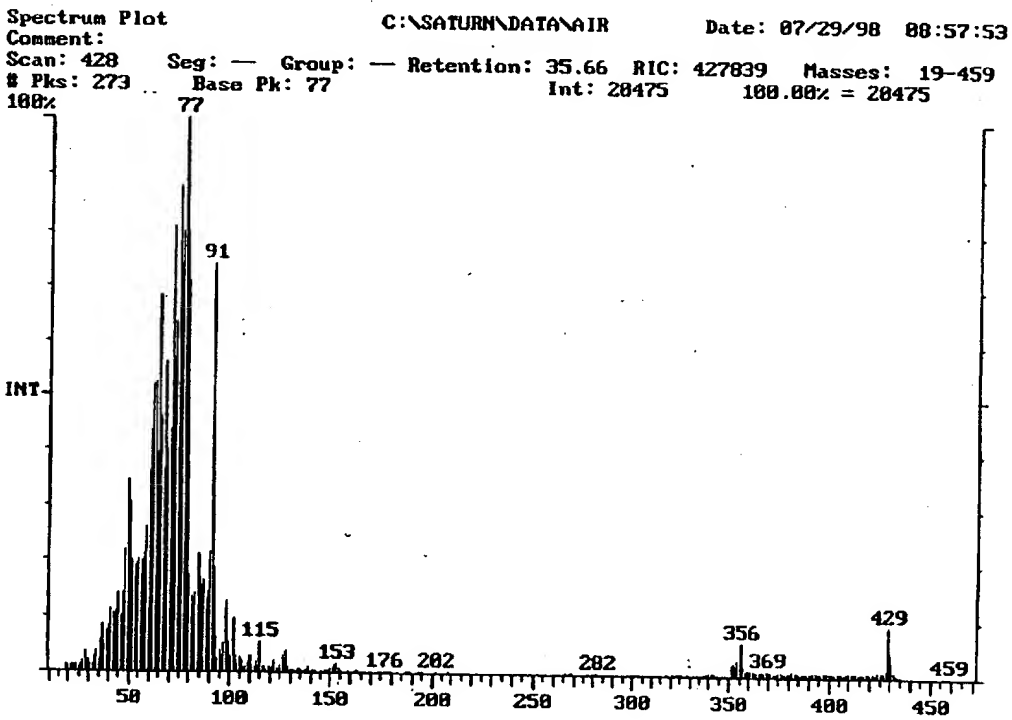

FIGURE 3.12: A reproduction of scan 428 at USF. Note the *dramatic* differences with the preceding scan 79 of Fig. 3.11 which confirm the *mutation the magnecules*. Note also the lack of systematic numerical periodicity in the mutations which are, therefore, at random, as expected from the internal collisions in a gas.

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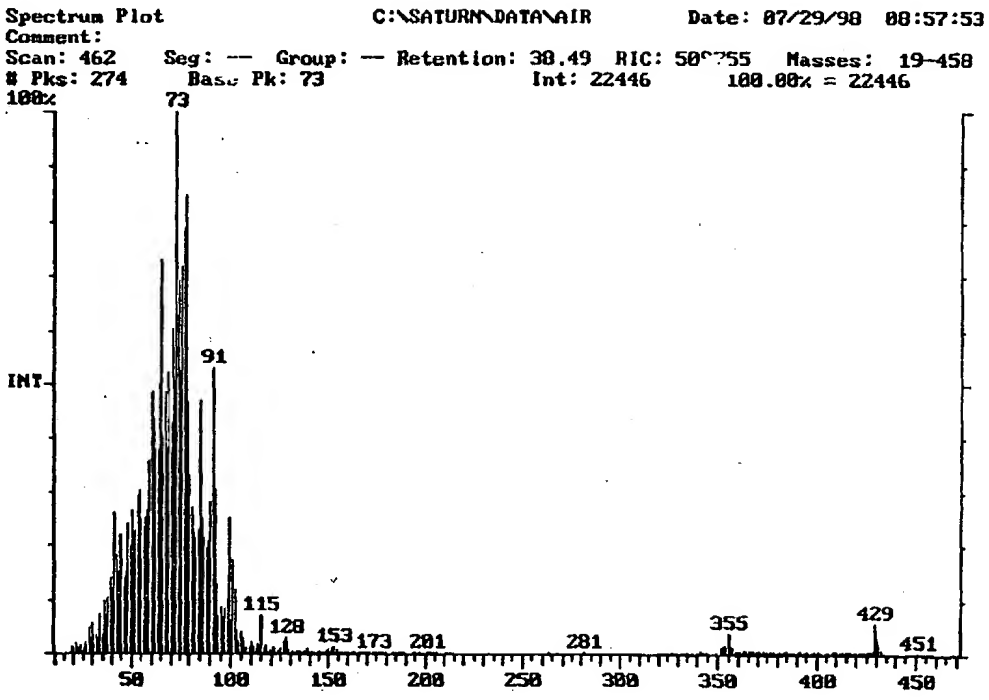

FIGURE 3.13: A reproduction of scan 462 of the USF measurements on AquaFuel which confirms the mutation of magnecules in time. Note the *decrease* of the main peak from 77 a.m.u. of the preceding figure to 73 a.m.u of this figure. Comparison of the two scans also identifies the mutations 202 → 201, 282 → 281, 356 → 355 which provide the ***first***

direct experimental verification of the presence in magnecules of individual hydrogen atoms. Moreover, the mutation of the main peak 77 → 73 provides ***the first experimental evidence of the existence of the elementary magnecule*** $(H_{\uparrow}-H_{\downarrow})\times(H_{\uparrow}-H_{\downarrow})$. In fact, AquaFuel contains helium only in ppm. Mutation 77 → 73 of the dominant peak cannot, therefore, be credibly explained via the loss of a helium atom.

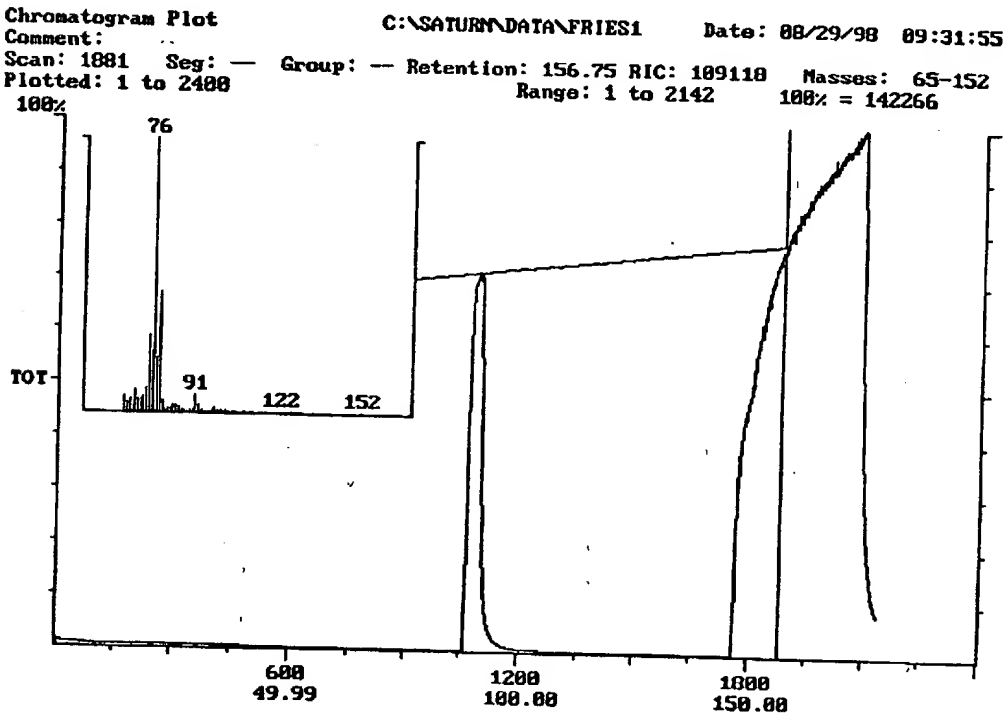

FIGURE 3.14: A reproduction of scan 1881 of the USF measurements on AquaFuel.

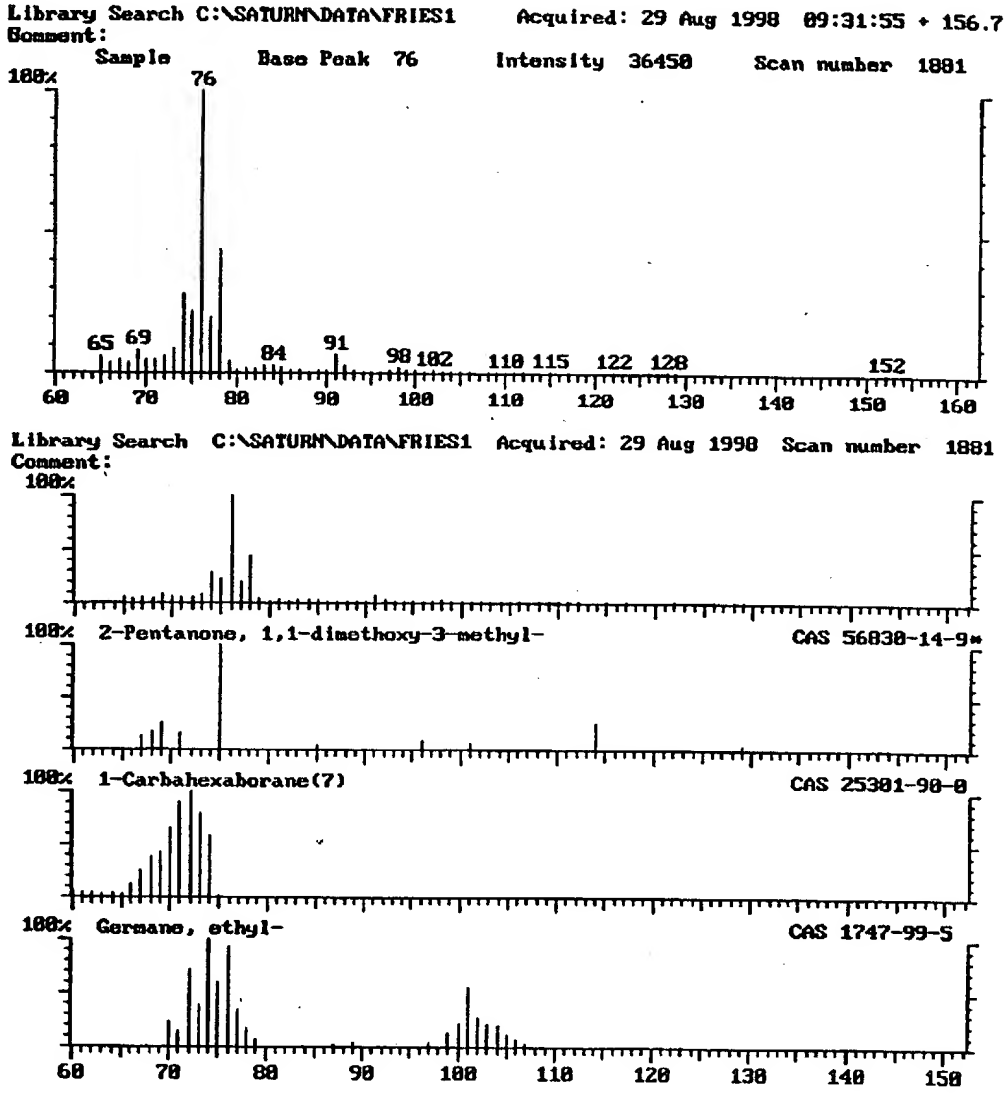

FIGURE 3.15: The lack of identification of the peak of scan 1881. Note that the computer provides 100% confidence on substances that cannot possibly exist in AquaFuel because of the lack of existence in AquaFuel of the necessary elements.

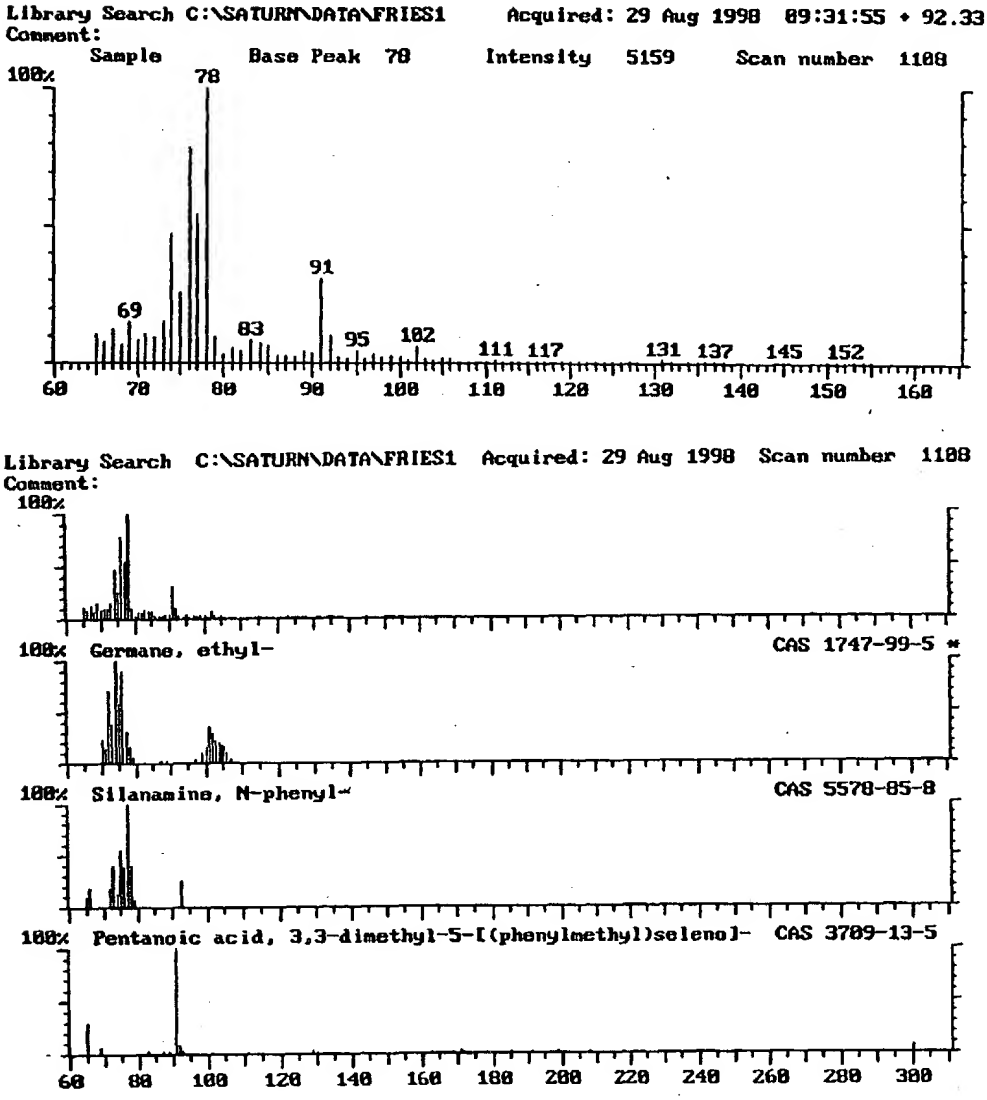

FIGURE 3.16: The lack of identification of the peak in scan 1108.

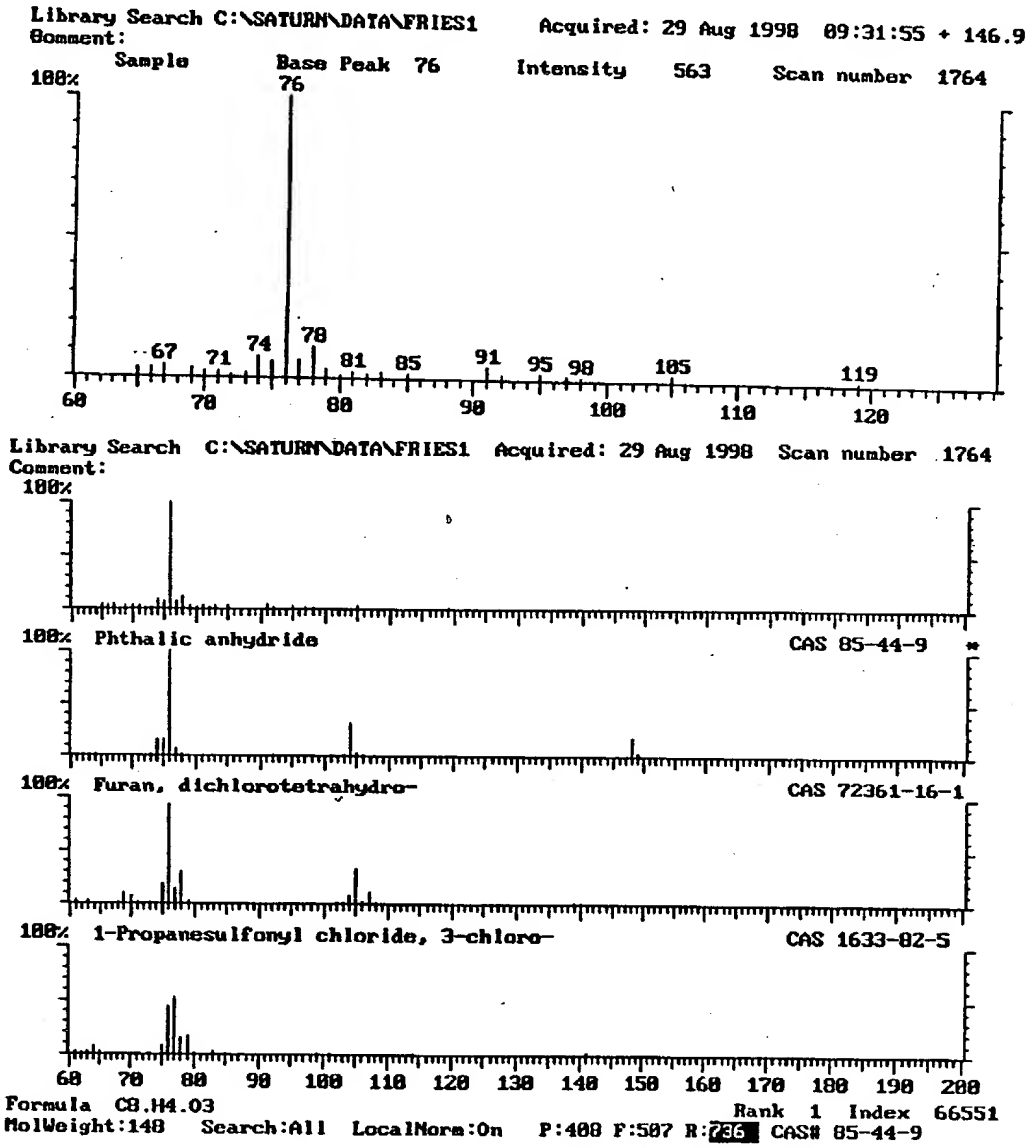

FIGURE 3.17: The lack of identification of the peak in scan 1764.

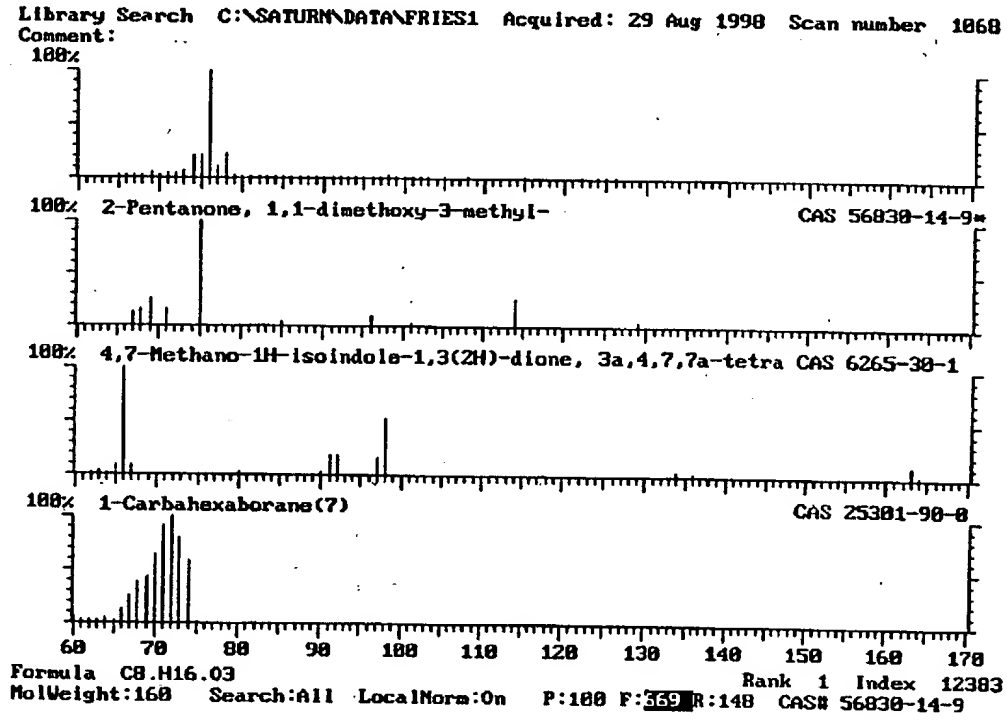

FIGURE 3.18: The lack of identification of the peak in scan 1068.

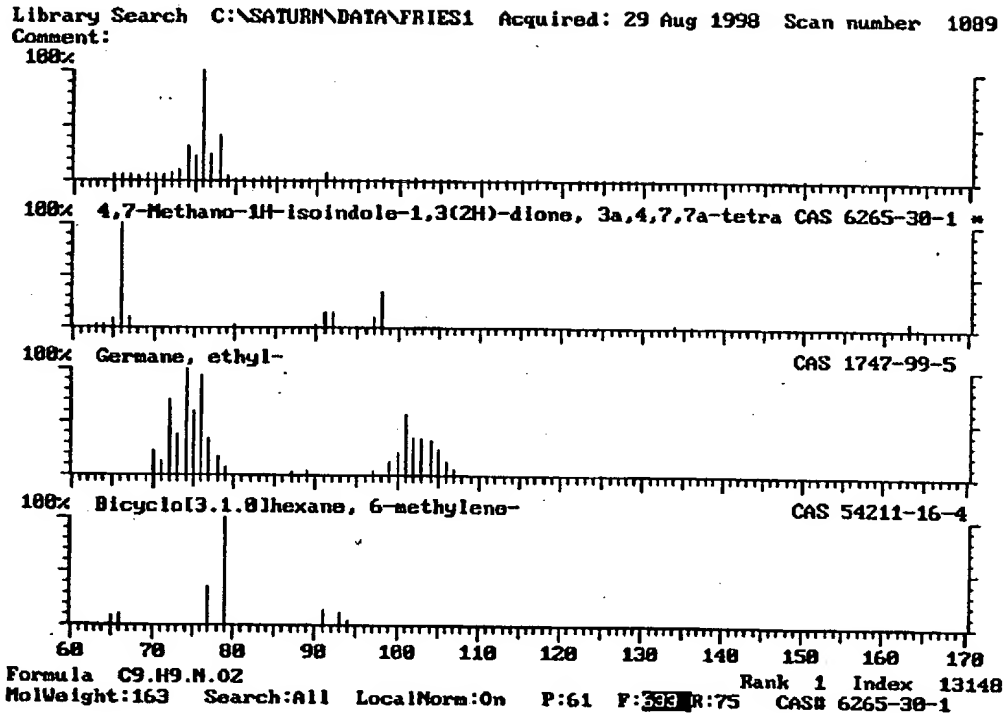

FIGURE 3.19: The lack of identification of the peak in scan 1089.

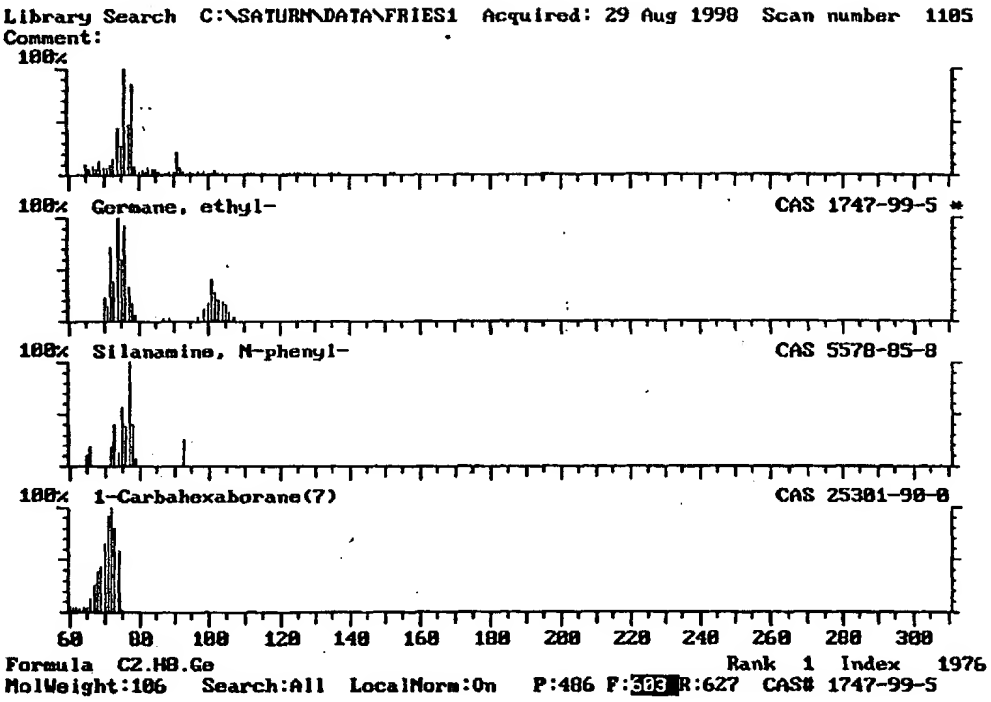

FIGURE 3.20: The lack of identification of the peak in scan 1105.

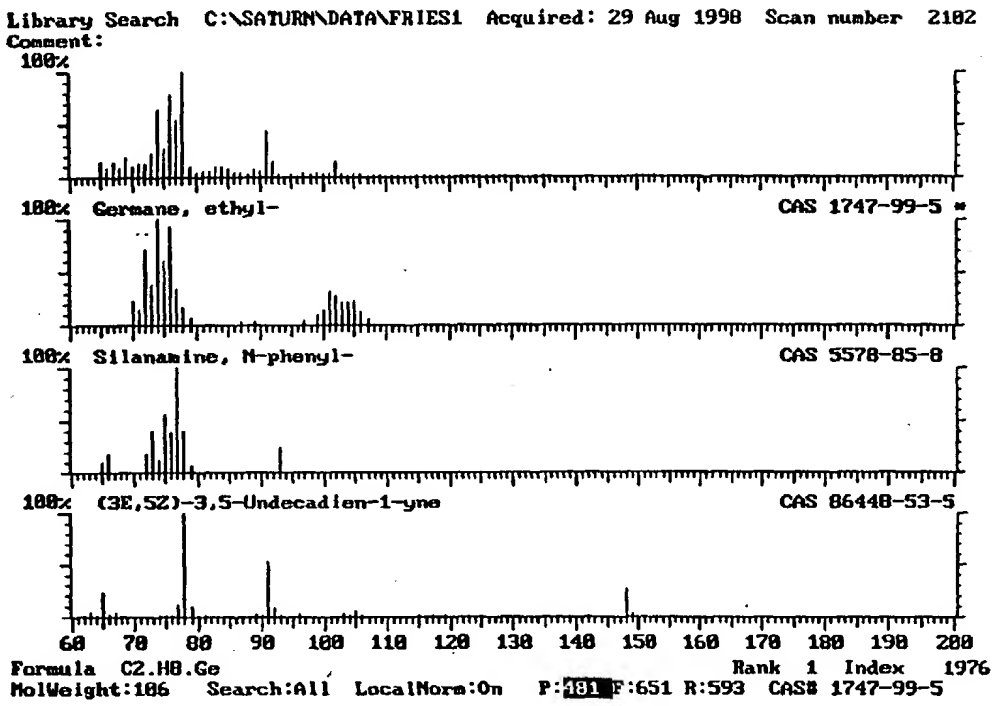

FIGURE 3.21: The lack of identification of the peak in scan 2102.

Experimental evidence on the disappearance of all unknown peaks at sufficiently high temperatures was established for the first time by Dr. ***N. Palibroda*** and Dr. ***P. Glueck*** at the *INSTITUTE FOR ISOTOPIC AND MOLECULAR TECHNOLOGIES* (IIMT) of Cluj-Napoka, Romania, also under TTL support, via a GC-MS MAT 311.

When operated at 150 C, the *same* sample of AquaFuel tested at NTS, PCFL and USF showed no unknown species at all, and only ordinary light gases with ppm of more complex composites of H, O and C. This provided additional support on magnecules as being made-up of ordinary molecules and atoms under a new bond of magnetic origin.

A number of additional experimental confirmation of the above GC-MS/IRD results are under way and they will be reported in future papers.

3.4. Enhanced energy release of magnetically polarized gases. A most scientifically intriguing and industrially significant features of magnetically polarized gases is a dramatic increase in energy released in thermochemical reactions as compared to the same reactions between the same gases in their conventional state.

This remarkable property is established for AquaFuel beyond credible doubt by numerous independent experimental verifications which I briefly outline below (see Web Site [6b] for a comprehensive reports).

As indicated in chemical analysis (3.1), AquaFuel has about 50 % of H_2, 40 % of CO, 9 % of CO_2, 0.2 % of O_2, and 0.,8 % of various composites of H., O and C in ppm.

By recalling that H_2 has 300 BTU/cf, simple ***theoretical calculations*** show that, according to quantum chemistry, AquaFuel should have about 167 BTU/cf, of which 150 BTU/cf are provided by the hydrogen and the remaining BTU's are provided by the remaining components (excluding noncombustible gases such as CO_2). The above theoretical value of energy content was confirmed by *ATLANTIC ANALYTIC LAB* of Whitehouse, New Jersey, *COSA INSTRUMENTS* of Norwood, New Jersey, and other independent laboratories [6b].

However, ***direct experimental tests*** conducted by comparing methane and AquaFuel in running a Coleman Generator powered by a Tecunseh 10 HP two cycles engine (which I have personally eyewitnessed) have established that ***AquaFuel produced from tap water has a minimum of 380 BTU/cf, contrary to the prediction by quantum chemistry that it should have 167 BTU/cf, thus***

resulting in an increase of energy release of 125 % (sic).

Numerous independent tests have not only confirmed the above experimental findings, but actually increased the anomalous release of energy. For instance, tests conducted by *TRI-TECH CORPORATION* (the multinational giant in cutting gases), the branch located in Tampa, Florida, and supervised by Mr. ***Joel D. Rentz,*** VP and Director of local research facilities, have established that ***AquaFuel cuts steel bars as fast and efficiently as acetylene which has 2,300 BTU/cf*** [6b].

This test indicates a loss of efficiency in the comparative burning of AquaFuel and methane in the preceding measurements due to a setting of the Tecunsseh two-cycle engine which is effective for methane, but not sufficient to release all energy content of AquaFuel.

A study of the literature and patents on new combustible gases [7] reveals that the above anomaly is typical of all gases produced under an electric discharge and, therefore, it is inherent in all magnetically polarized gases.

Systematic studies on the origin of this anomaly are under way. I provide below a *conceptual* outline in the hope of stimulating a collegial study of the anomaly due to its evident scientific and industrial significance.

Document5 - 0005

Expected first origin of increased energy release.

According to quantum chemistry, gas molecules in their conventional spherical shape due to rotations are ready for chemical reactions. For instance, in reaction

$$H_2 + O_2 / 2 \rightarrow H_2O + 57 \text{ Kcal / mol}, \qquad (3.3)$$

it is sufficient that the spherically symmetry hydrogen atoms enters in contact with the oxygen atom to activate the exchange and other molecular forces, thus creating the water molecule.

According to hadronic chemistry this is basically not the case. As one can see via a visual inspection of the isochemical model of the hydrogen molecule (Fig. 1.6) and of the water molecule (Fig. 1.7), ***the creation of the water molecule requires the prior elimination of rotational motions.***

It is then evident that ***the magnetic polarization eliminates molecular rotations, thus preparing the atoms in the form needed for bonding with other atoms, with consequential increase of the efficiency of the chemical reaction and resulting higher energy release.***

Preliminary calculations have however indicated that the above origin of the

energy anomaly is insufficient to provide a quantitative explanation of the more than doubling of the energy release.

Expected second origin of increased energy release.

Ordinary molecules have no mutual attractions, again, due to their rotations, while ***magnetically polarized molecules can instead attract each other, thus implying an additional increase in the efficiency of reactions*** such as (3.3).

Despite their plausibility, the above two origins of the energy anomaly are still insufficient to explain how AquaFuel can cut a steel bar as fast and efficient as acetylene.

Expected third origin of increased energy release.

A third plausible origin is suggested by the anomaly of the IR signature of conventional polarized molecules, such as those of Figs. 3.4 and 3.8. In fact, such anomaly implies the presence of ***new internal bonds in conventional molecules, with consequential increase of the binding energy and resulting increase of energy release in esorthermic reactions.***

Note that a 125 % increase of energy release implies the increase of energy released by reaction (3.3) from 57 Kcal/mole to 137 Kcal/mole.

In summary, ***the dramatic increase of energy release by magnetically polarized gases, more than double that of the same unpolarized gases, is the most convincing evidence I have encountered to date on the insufficiencies of quantum chemistry in its most important topic, the molecular structure.***

3.5. The new technology of magnetically polarized gases at Toups Technology Licensing. It is evident that all the above properties imply the birth of the ***new technology of magnetically polarized gases*** which is currently under systematic development and comprehensive patenting at *TOUPS TECHNOLOGY LICENSING* (TTL).

This new technology is based on new means for inducing the polarization of the orbits of (come of) the electrons of conventional gases, and includes comprehensive structural analyses of the gases, as well as measurements of their anomalous physical characteristics and chemical behavior.

As an indication, the *measurement of the number of octanes of AquaFuel as a fuel have* not been possible because readings went over the upper limit of the instrument scale (160 octanes) and no octane measuring equipment is apparently available for over that limit.

This evidence alone is sufficient to establish Anomaly 3.6 on the mutation of

physical characteristics.

Since a number of developments are currently under patenting, I am not at liberty to identify in detail the various aspects and applications of the new technology. I therefore limit myself to the following indications:

More efficient methods of liquefaction of conventional gases. A strong magnetic polarization of any gas is expected to create significant molecular attractions. Less energy for liquefaction is then expected.

Better fuels. The magnetic polarization of any fuel (whether gaseous or liquid) is expected to yield: 1) an increase in energy content as studied in Sect. 3.4; 2) an increase in number of octanes without any chemical manipulation; and 3) a consequential improvement of the combustion exhausts. The automotive implications are evident and so are others, such as the use of k,magnetically polarized hydrogen and oxygen gases in rocket propulsion is expected to permit a significant increase of the payload for the same amount of fuel or its decrease for the same payload.

More efficient fuel cells. As it is well known, current practical applications of fuel cells are limited by their low efficiency. An enhancement of their efficiency is evidently expected from any enhancement of energy release.

I hope to present in some future papers more technical disclosures of the new technology.

p.851-5.2.94.doc

4. EXPERIMENTAL EVIDENCE OF MAGNECULES IN LIQUIDS AND SOLIDS AT GIVAUDAN–ROURE CORPORATION

4.1. Creation of magnecules in liquids. The way in which I first created magnecules in liquids is the following.

In early 1998 I obtained a number of samples of fragrance oils thanks to the courtesy of the multinational giant in the perfumes industry, *GIVAUDAN ROURE CORPORATION* (GR) with headquarters in Teaneck, New Jersey, and thanks in particular to: Mr. ***Andrew J. Herskee,*** Senior Vice President; Dr. ***Thomas McGee,*** Senior Vice President for; Mr. ***Kenneth L. Purzycki,*** Director of Fragrance Science; Dr. ***Konrad Lerch,*** Senior Vice President and Director of Corporate Research Laboratories in Dubendorf, Switzerland; and other GR members. The samples were obtained also via the collaboration of Mr. ***Lawrence Perovetz,***

President of *MILLENNIUM CORPORATION* (MC) of Orlando, Florida.

I then placed about 50 cc of various samples of perfectly transparent fragrance oils in individual glass containers and immersed in the oils one polarity of an alnico permanent magnet with 12,000 G and dimension 1/2" × 1" × 2" supplied by *BUNTING MAGNETIC CORPORATION* of Newton, Kansas.

Starting with perfectly clear oils of known viscosity, I observed after a few days a visible darkening of the oils, jointly with a visible increase of the viscosity, changes which evidently varied from oil to oil. Both the darkening and the viscosity increased progressively in subsequent days, to reach in certain cases a dark brown color completely opaqueness to light and an increase in viscosity to such an extent to lose all fluidity.

Following the darkening, in certain samples there was the creation of floating objects which grew in time to such a size to be visible to the naked eye.

I should stress that the above visible effects are of pure magnetic origin because of the lack of any other contribution, e.g., the complete absence of any additives. After the immersion of the permanent magnets, all samples were left open and undisturbed at ordinary room conditions.

The above tests established beyond scientific doubt that the alteration of the characteristics of the oil was of sole magnetic origin, thus excluding all other possible sources.

My main hypothesis on the reason for the darkness of the oils is that their molecules acquire a magnetic polarization of in the orbits of at least some of their electrons (cyclotron resonance orbits), by therefore bonding to each other along lines similar to those for gases.

I should indicate that the samples of fragrance oils were sent from Givaudan-Roure Corporation for novel applications I am not at liberty to disclose at this writing. In this presentation I merely disclose essential scientific aspects.

Moreover, the reader should be aware that immersion of one polarity of a permanent magnet in fragrant oils is, evidently, the most rudimentary possible way to create magnecules and that a number of more sophisticated magnetic polarization techniques are now available with a rather complex geometry which also I am not at liberty of disclosing at this time.

4.2. Photographic evidence of magnecules in liquids. The following Figures 4.1 and 4.2 were taken via an optical microscope by Dr. ***Konrad Lerch,*** Senior Vice President and Director of the GR Corporate Research Laboratories in Dubendorf, Switzerland, and his associates, with the assistance of Mr. ***Lawrence***

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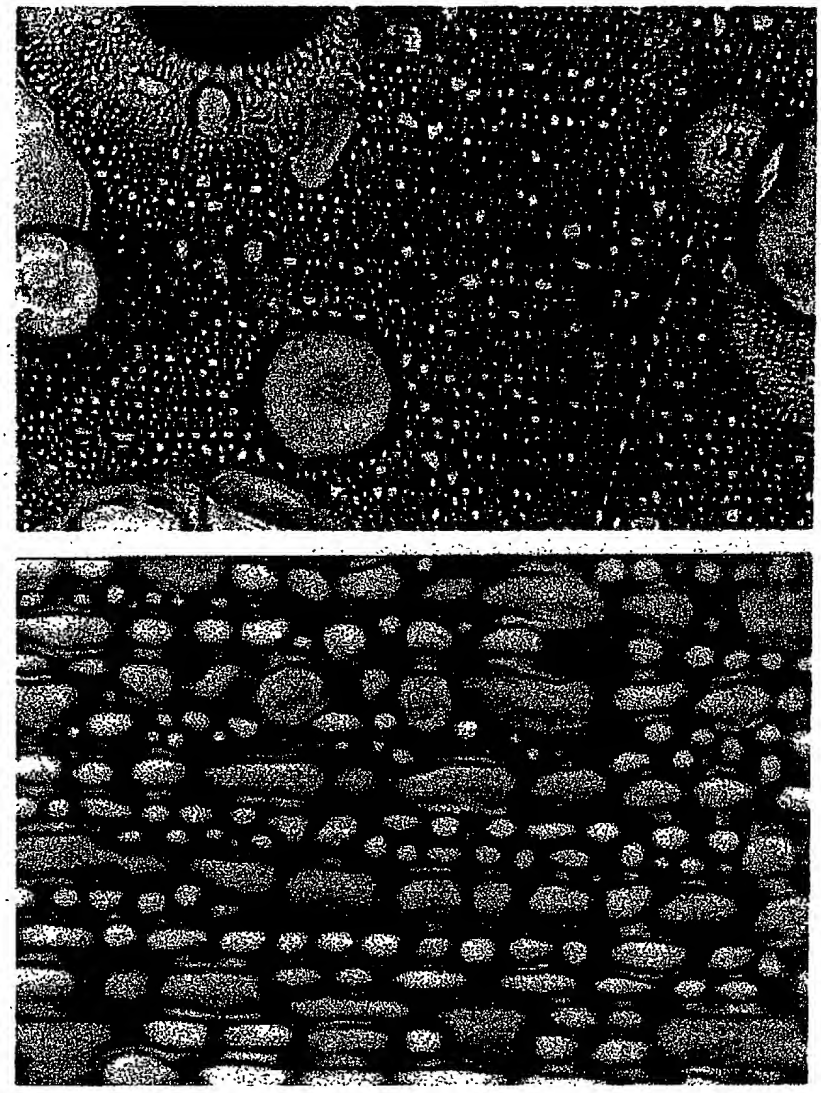

FIGURE 4.1: ***First photographic evidence of magnecules in liquids*** obtained by Dr. ***Konrad Lerch,*** Director of the GR Research Laboratory in Dubendorf, Switzerland, on in the GR fragrance oil "ING258IN Test 2" under magnifications 10X and 100X.

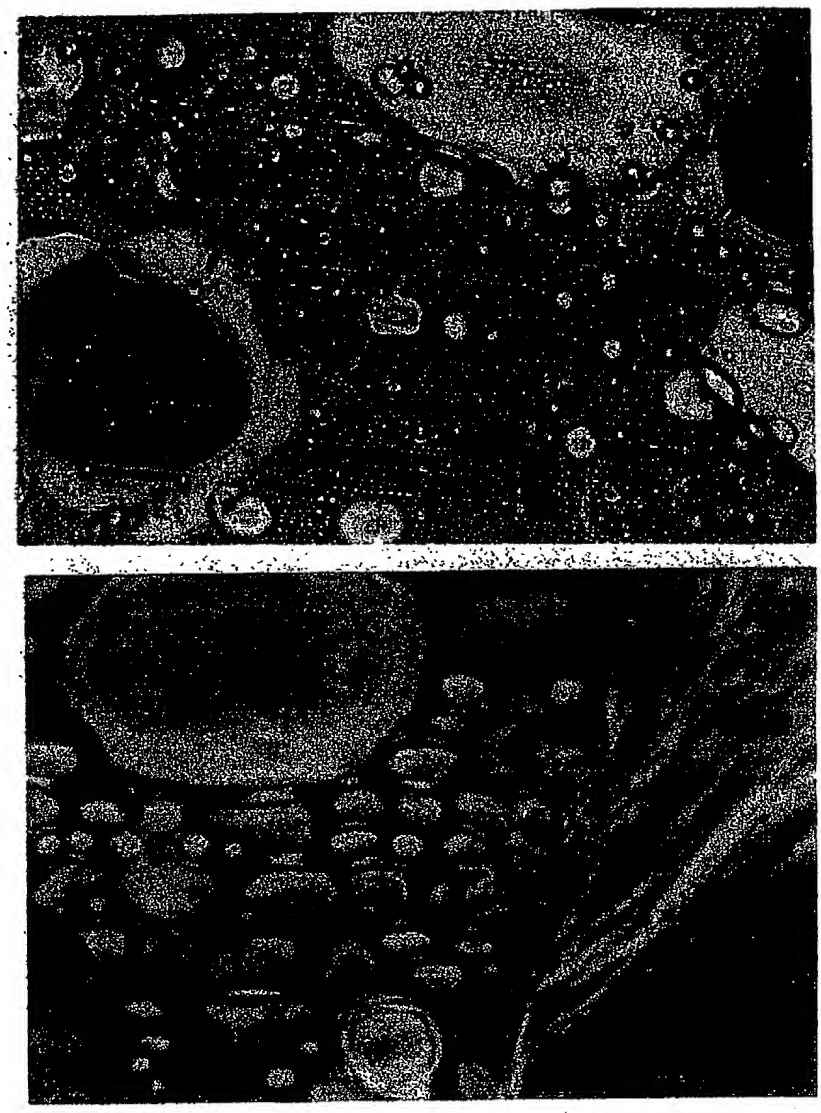

FIGURE 4.2: Additional photographs of magnecules also in "ING258IN Test 2" under magnifications 10X and 100X and also obtained at the GR Research Laboratory in Dubendorf, Switzerland. Note the difference in magnecule sizes with the preceding figure.

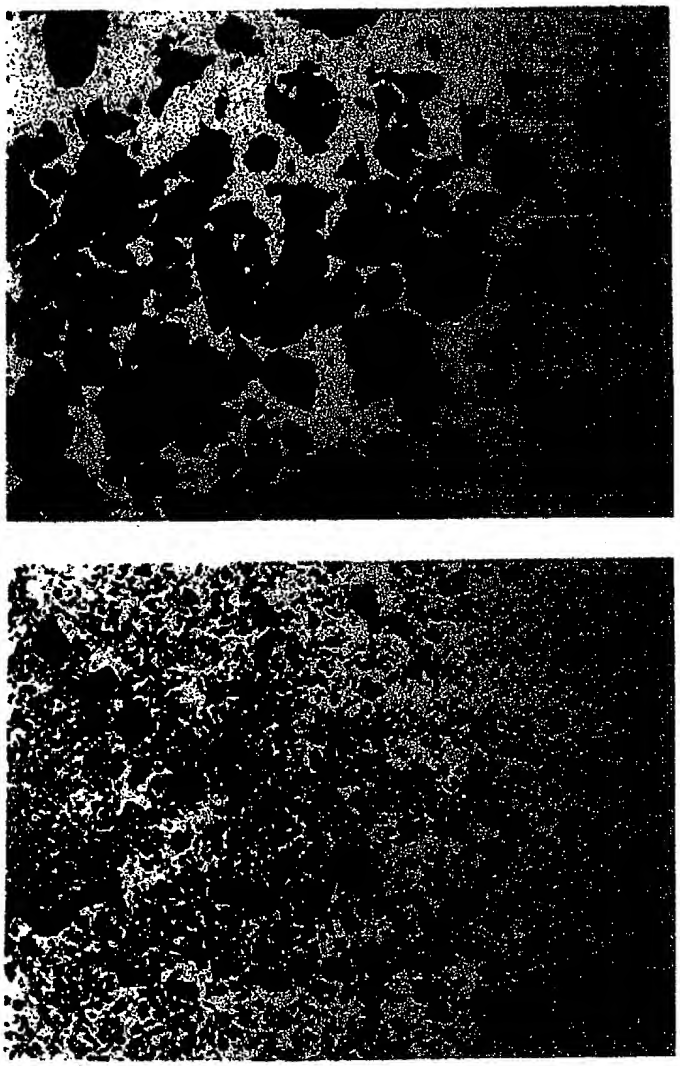

FIGURE 4.3: Confirmation of magnecules in GR fragrance oil "Mixture 2" under 10X and 100X obtained by analyst ***David Fries*** at USF. Note the difference in sizes of the magnecules and their difference with those of Figs. 4.1 and 4.2.

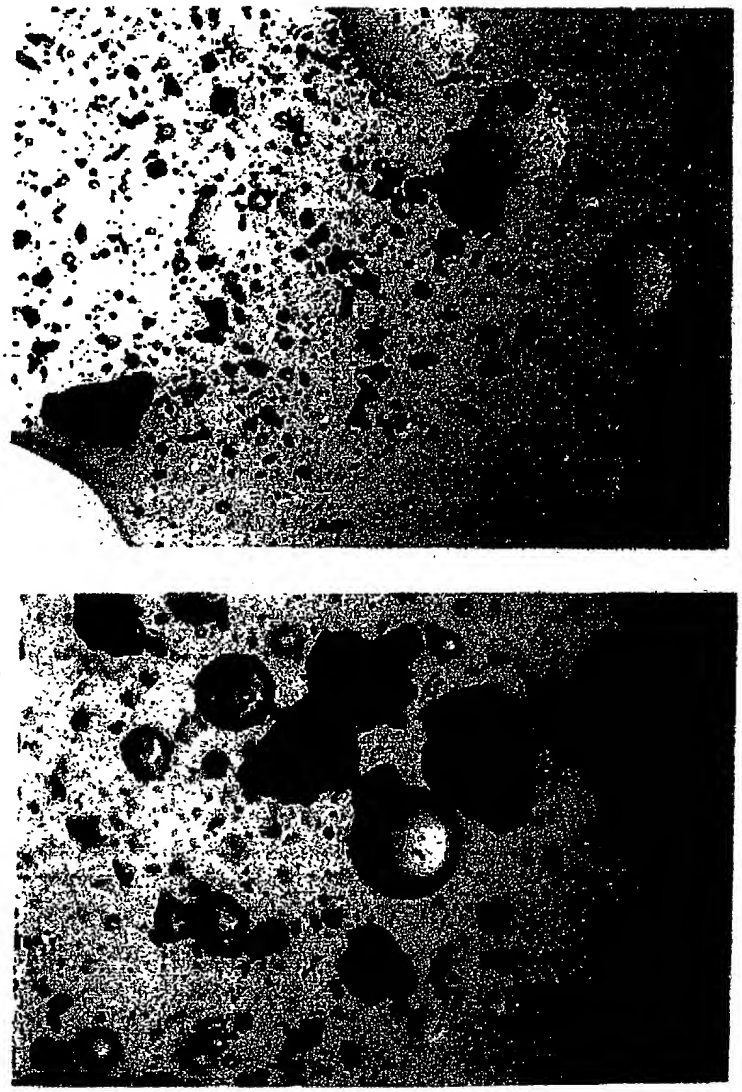

FIGURE 4.4: Additional photographs of magnecules, this time in GR fragrance oil "INX–02349", also obtained by analyst ***David Fries*** at the USF. The visible bubbles are of unknown composition.

Perovetz, MC President.

The pictures refer to the GR fragrance oil received under the code "ING258AIN, Text 2" subjected to the rudimentary magnetic polarization indicated in the preceding section under the respective magnification 10X and 100X

As one can see, these photographs establish that, under the indicated magnetic treatment, the oil has acquired a structure of the type of "brick layering" which is visible under only 10X magnification (top of Figs. 4.1 and 4.2), which is per se highly anomalous for a liquid that was originally fully transparent. The magnecules are constituted by the individual "bricks" shown in the 100X magnification (bottom of the figures).

Inspection of the various photograph shows a variety of sizes of magnecules, thus establishing their lack of unique characteristics for any given oil. This evidently confirms the *lack* of a valence bond (evidently because the latter would imply a fixed maximal size). The photographs also show the magnecules capability for accretion, that is, the capability of increasing their size via the addition of further oil molecules.

The photographs in Figures 4.3 and 4.4 were taken by analyst ***David Fries*** of the *CENTER FOR OCEAN TECHNOLOGY* of the *UNIVERSITY OF SOUTH FLORIDA* (USF) in St. Petersburg, thanks to financial support by *TOUPS TECHNOLOGY LICENSING* (TTL) of Largo, Florida.

These additional photographs are for the same magnifications 10X and 100X, but refer to different GR fragrance oils. Fig. 4.3 depicts the GR oil "Mixture 2" magnetically treated to such a point to completely lose transparence and fluidity while Fig. 4.4 depicting GR oil "INX–01349" with a visible change in color and increase in viscosity.

As one can see, the latter picture provide incontrovertible confirmation that, following exposure to a 12,000 G magnetic field, fragrance oil molecule bond together into rather large clusters estimated to be well in excess of 10,000 a.m.u., thus confirming Anomaly 3.1 for liquids.

Other photographic documentations of various magnecules in liquids are available confirming the above findings. They are not reproduced here for brevity.

4.3. Spectroscopic evidence of magnecules in liquids. The first experimental evidence on magneclusters in liquids was established on May 5, 1998, by analysts ***Brian Wallace*** and ***Mia Burnett*** at *TEKMAR–DOHRMANN CORPORATION* (TDC) in Cincinnati, Ohio, by operating a Tekmar 7000 HT Static Headspacer Autosampler equipped with a Flame Ionization Detector (FID). The tests were repeated on May 8 and 11, 1998, by confirming the preceding results. The

Petitioner's Exhibit 1029, p. 857

tests were done with the assistance of Mr. *Lawrence Perovetz,* MC President.

The measurements were done on: Sample 1, pure (magnetically untreated) GR "Fragrance Oil 2"; Sample 2, magnetically utreated tap water; and Sample 3, a magnetically treated mixture of the two.

It should be noted that the Tekmar equipment lacks the computer search as well as the UV scan. Also, recall that magnecules in a *light gas* can have molecular weight all the way to 1,000 a.m.u. and more, as established in AquaFuel.

It then follows that magnecules in *liquids* can have much bigger molecular weight all the way to 10,000 amu and more, thus requiring instruments cryogenically operated and kept at room temperature, equipped with extra large feeding lines, and capable to scan all the way to very high molecular weights. The latter features were absent in the considered Tekmar instrument.

Despite that, the results of the Tekmar tests constitute ***the first direct spectroscopic experimental evidence of the existence of magnecules in liquids,*** including ***the first direct experimental evidence of water magneplexes*** as per Definition 2.1 (see the complete documentation in Appendix IV of Ref. [3f]).

PROOF - 5/5/98

```
Software Version: 4.0<4J28>
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Data File     : C:\TC4\HP210\MY04003.RAW   Date: 5/4/98  04:44 PM
Sequence File : C:\TC4OLD\HP210\MY04.SEQ   Cycle: 3   Channel : B
Instrument    : 772_-_2   Rack/Vial: 0/0   Operator: mb
Sample Amount     : 1.0000                 Dilution Factor  : 1.00
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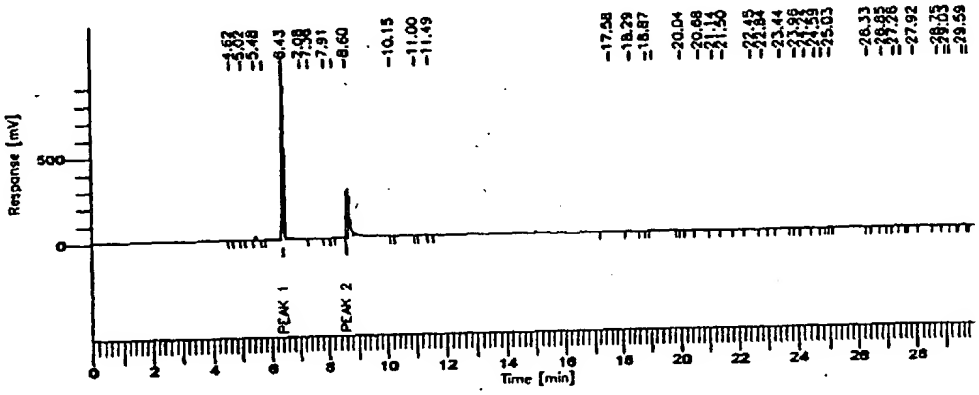
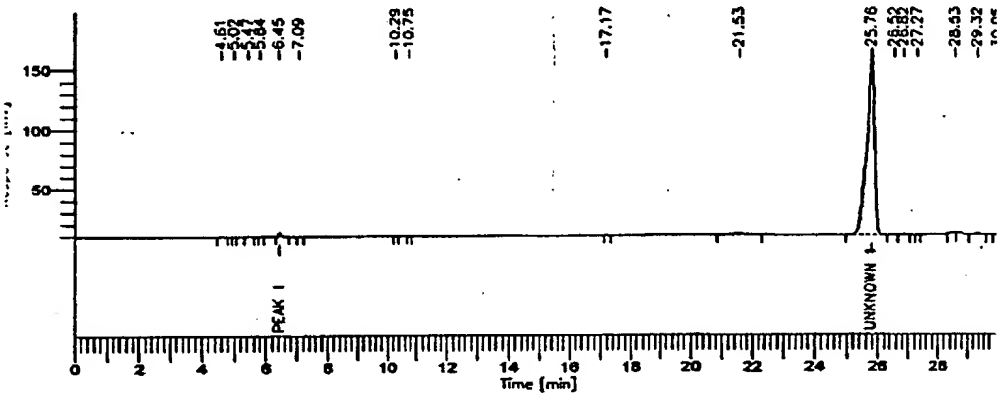


DEFAULT REPORT

Peak #	Component Name	Time (min)	Area (μV·s)	Area (%)
1		4.620	2106.00	0.01
2		5.022	432.00	0.00
3		5.479	68060.38	0.43
4		5.731	1120.12	0.01
5	peak 1	6.430	3894142.72	24.38
6		7.077	23106.00	0.14
7		7.355	8426.66	0.05
8		7.911	1549.62	0.01
9		8.163	190.00	0.00
10	peak 2	8.604	509716.00	3.19
11		10.146	829.00	0.01
12		10.999	338.00	0.00
13		11.485	798.00	0.00
14		17.582	9646.00	0.06
15		18.296	814.50	0.01
16		18.871	748.51	0.00
17		19.082	12390.99	0.08
18		20.043	582.50	0.00
19		20.679	4000.46	0.03
20		21.139	654.15	0.00
21		21.500	716.38	0.00
22		22.452	4196.12	0.03
23		22.837	1128.88	0.01
24		23.637	10546.00	0.07
25		23.958	1292.73	0.01
		24.241	5968.77	0.04
		24.587	980.85	0.01
		24.764	700.15	0.00
29		25.034	221.00	0.00
30		26.330	189.00	0.00
31		26.849	7912.00	0.05
32		27.264	19913.14	0.12
33		27.461	10844.38	0.07
34		27.918	1332.00	0.01
35		[illegible]	751.69	0.00
		29.026	3094.14	0.02
		29.163	2312.68	0.01
		29.589	30846.00	0.19
39		29.750	383.00	0.00
40		30.320	6254.00	0.04
41		31.370	3617.37	0.02
42		31.720	51605.63	0.32
43		32.296	268.00	0.00
44		32.319	87913.29	0.55
45	Peak 3	32.742	11181133.21	70.00
			15973772.00	100.00

FIGURE 4.5: A reproduction of one of the scab conducted on May 5, 1998, at 8.18 a.m., by analysts ***Brian Wallace*** and ***Mia Burnett*** at *TEKMAR-DOHRMANN CORPORATION* (TDC) in Cincinnati, Ohio, by operating a Tekmar 7000 HT Static Headspacer Autosampler equipped with a Flame Ionmization Detector (FID). The scan is for a sample of magnetically untreated GR fragrance oil received under the label of "Mixture 2" which results to be composed by three primary molecular constituents with: Peak 1 at 6.430 min and 24.28 %; Peak 2 at 8.604 min and 3.19 %; and Peak 3 at 37.742 and 70.00 % (off scan scale), totaling 97.57 %. This provides the chemical structure of the fragrance oil in Fig. 4.3.

oftware Version: 4.0<4J28>
ate: 5/5/98 08:20 AM
ample Name : 500ul H2O ID#2
ata File : C:\TC4\HP210\MY04005.RAW Date: 5/4/98 06:06 PM
uence File: C:\TC4OLD\HP210\MY04.SEQ Cycle: 5 Channel : B
strument : 772_-_2 Rack/Vial: 0/0 Operator: mb
ample Amount : 1.0000 Dilution Factor : 1.00



DEFAULT REPORT

eak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		4.614	2904.00	0.07
2		5.024	375.50	0.01
3		5.469	1328.00	0.03
4		5.844	322.00	0.01
5	peak 1	6.446	17310.50	0.43
6		7.088	390.00	0.01
7		10.288	164.00	0.00
8		10.746	189.00	0.00
9		17.171	970.50	0.02
10		21.527	32334.00	0.81
11	unknown 1	25.763	2565644.21	64.24
12		26.522	2794.13	0.07
13		26.821	3354.66	0.08
14		27.271	184.00	0.00
15		28.534	3914.50	0.10
16		29.315	9941.00	0.25
17		30.048	1062.00	0.03
18		30.981	1916.00	0.05
19	unknown 2	31.653	1339095.00	33.53
20	Peak 3	32.680	9951.00	0.25
			3994144.00	100.00

FIGURE 4.6: The ***first spectroscopic experimental evidence of magneplexes in magnetically treated tap water,*** achieved on May 5, 1998, at 8.20 a.m. by analyst ***Mia Burnett*** and her associates at TDC. The magneplexes are characterized by the large "unknown" peak at 25.763 min for 64.24 % identifying an anomalous water clustering

Software Version: 4.0<4J28>
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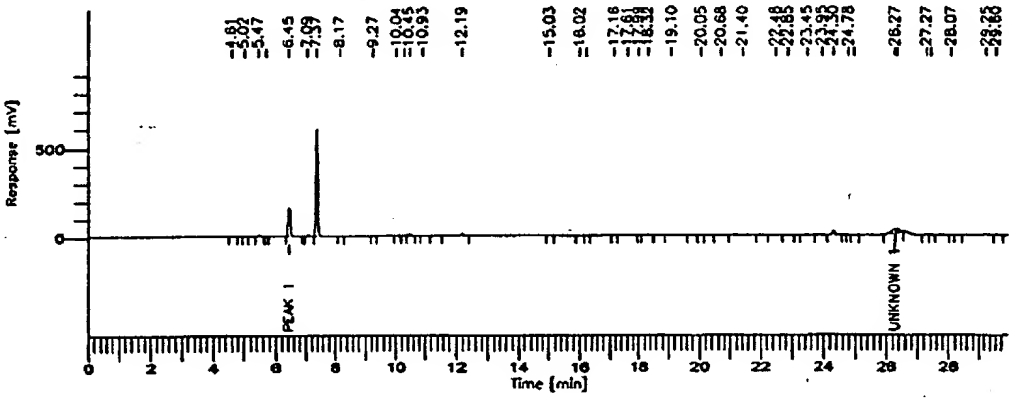
Sample Name : 500ul Oil&H2O ID#3
Data File : C:\TC4\HP210\MY04009.RAW Date: 5/4/98 08:50 PM
uence File: C:\TC4OLD\HP210\MY04.SEQ Cycle: 9 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



DEFAULT REPORT

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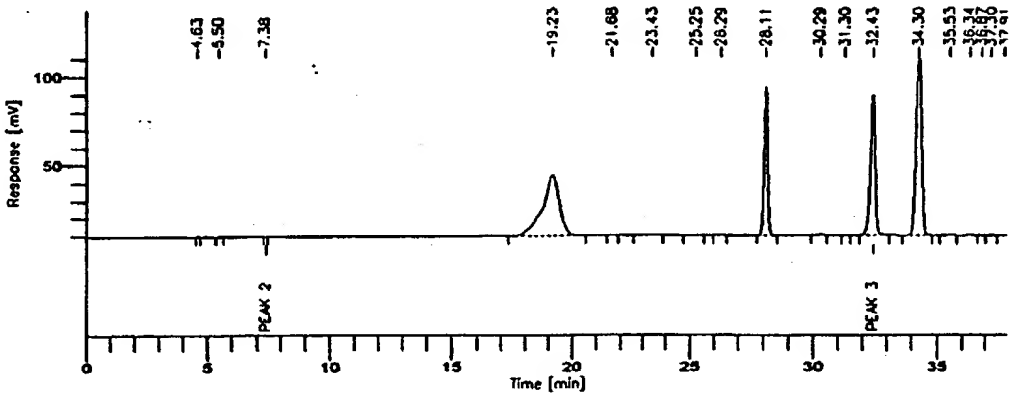
2		5.021	482.50	0.00
3		5.466	14446.00	0.11
4		5.716	302.00	0.00
5	peak 1	6.449	700997.00	5.33
6		7.085	17702.00	0.13
7		7.373	2463631.95	18.74
8		8.174	1041.55	0.01
9		9.273	398.50	0.00
10		10.038	693.50	0.01
11		10.287	407.59	0.00
12		10.454	32776.91	0.25
13		10.932	455.00	0.00
14		12.185	45046.00	0.34
15		15.029	735.50	0.01
16		16.018	363.50	0.00
17		16.215	289.50	0.00
18		17.163	405.10	0.00
19		17.607	8138.75	0.06
20		17.989	258.64	0.00
21		18.323	773.50	0.01
22		19.101	7936.00	0.06
23		20.050	1513.00	0.01
24		20.684	3329.49	0.03
25		21.403	6640.01	0.05
		22.477	3417.00	0.03
		22.848	1399.00	0.01
		23.453	8746.50	0.07
29		23.945	5373.77	0.04
30		24.296	89748.23	0.68
31		24.777	1228.40	0.01
32		24.964	2011.60	0.02
33	unknown 1	26.272	229566.61	1.75
34		26.347	152811.39	1.16

Result File : ~RST105F.RST, Printed On 5/5/98 08:21 AM page 2

Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
35		27.273	23098.00	0.18
		27.410	13015.00	0.10
		28.070	324.00	0.00
		29.254	52774.58	0.40
39		29.599	19904.00	0.15
40		30.345	65596.75	0.50
41		30.880	2408.67	0.02
42		31.387	6170.93	0.05
43	unknown 2	31.491	59456.07	0.45
44		32.089	664.00	0.01
45		32.528	64277.94	0.49
46	Peak 3	32.758	9034646.06	68.71
			13148362.00	100.00

FIGURE 4.7: The ***first spectroscopic experimental evidence of magnecules in liquids*** achieved on May 5, 1998, at 8.21 a.m., by analysts ***Brian Wallace*** and ***Mia Burnett*** at TDC, on a magnetically treated combination of GR "Mixture 2" and tap water. Note the primary constituents: a first peak at 6.449 for 5.33 %; a second peak at 7.373 min for 18.74 %; a third peak listed by the equipment as "unknown 1" at 26.272 min for 1.75 %; a fourth peak at 26.347 for 1.16%; a fifth peak listed by the equipment as "unknown 2" at 31.491 for 0.45 %; and a sixth peak at 32.758 min for 68.71 %; totaling 96.14 %. Comparison of these data with those on the untreated oil as well as untreated water establish numerous macroscopic alterations (mutations) of chemical constituents, their ramp time and their percentages which can only be interpreted as due to magnecules.

Software Version: 4.0<4J28>
Date: 5/5/98 02:06 PM
Sample Name : Blank
Data File : C:\TC4\HP210\MY05001.RAW Date: 5/5/98 09:08 AM
Sequence File: C:\TC40LD\HP210\MY05.SEQ Cycle: 1 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00

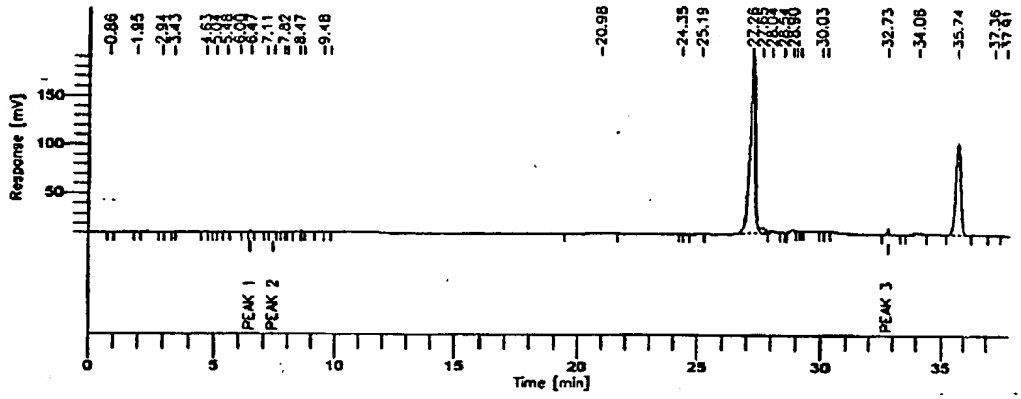


DEFAULT REPORT

Peak #	Component Name	Time [min]	Area [μV·s]	Area [%]
1		4.633	2621.00	0.05
2		5.496	695.50	0.01
3	peak 2	7.379	293.00	0.01
4		19.227	1795761.00	33.57
5		21.679	1071.00	0.02
6		23.432	18393.00	0.34
7		25.247	6824.50	0.13
8		26.290	2393.00	0.04
9		28.110	835586.00	15.63
10		30.291	12877.00	0.24
11		31.296	1435.00	0.03
12	Peak 3	32.425	1135236.50	21.22
13		34.296	1508602.50	28.20
14		35.532	6202.50	0.12
15		36.344	9033.76	0.17
16		36.866	1934.19	0.04
17		37.297	7005.45	0.13
18		37.914	2731.10	0.05
			5349096.00	100.00

FIGURE 4.8: The ***first spectroscopic experimental evidence of anomalous adhesion of magnetically treated liquids*** achieved on May 5, 1998, at 2.06 p.m., by analysts ***Brian Wallace*** and ***Mia Burnett*** and her associates a TDC, depicting a background following the tests similar to the tests themselves, including new "unknowns". It should be noted that, at the time of the tests, the analysts were unaware of the anomaly.

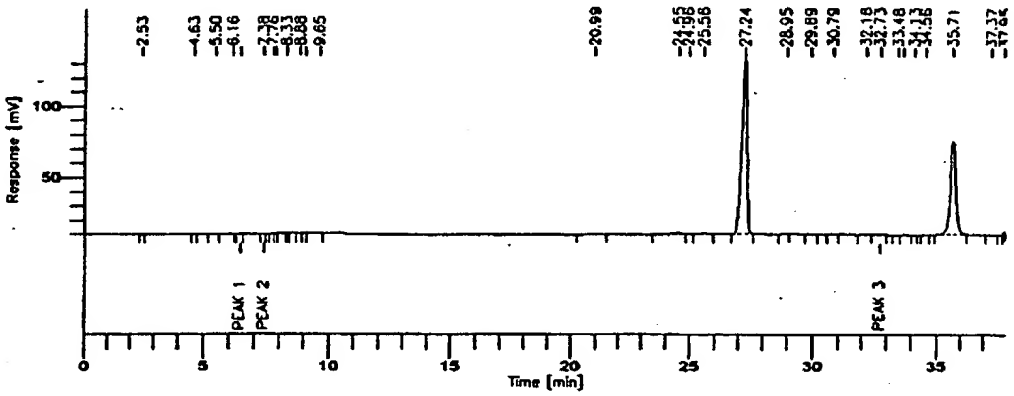
Software Version: 4.0<4J28>
Date: 5/5/98 02:08 PM
Sample Name : ID#2 H2O
Data File : C:\TC4\HP210\MY05006.RAW Date: 5/5/98 12:53 PM
Sequence File: C:\TC4OLD\HP210\MY05.SEQ Cycle: 6 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		0.863	336.50	0.01
2		1.945	352.50	0.01
3		2.935	260.00	0.01
4		3.431	138.00	0.00
5		4.627	6093.50	0.14
6		5.039	267.00	0.01
7		5.483	1176.05	0.03
8		6.000	614.95	0.01
9	peak 1	6.472	10192.00	0.23
10		7.110	531.26	0.01
11	peak 2	7.401	1525.24	0.03
12		7.819	240.00	0.01
13		7.952	113.00	0.00
14		8.465	600.50	0.01
15		8.656	221.00	0.00
16		9.481	548.00	0.01
17		9.758	562.00	0.01
18		20.976	30735.50	0.69
19		24.346	263.00	0.01
20		25.192	1078.00	0.02
21		27.258	2656625.73	59.56
22		27.649	89561.00	2.01
23		28.040	43010.33	0.96
24		28.544	2008.94	0.05
25		28.897	20488.43	0.46
26		29.049	3501.57	0.08
27		29.202	1250.00	0.03
28		30.032	1068.56	0.02
29		30.228	2652.44	0.06
30	Peak 3	32.732	34944.00	0.78
31		34.063	37651.00	0.84
32		35.738	1505974.50	33.76
33		37.364	3314.42	0.07
34		37.912	2763.58	0.06

FIGURE 4.9: The subsequent print-out of the TDC tests at 2.08 p.m. on the magnetically treated water. Note the visible difference with the test of Fig. 4.6 due to the anomalous adhesion of oil molecules which remained in the instrument.

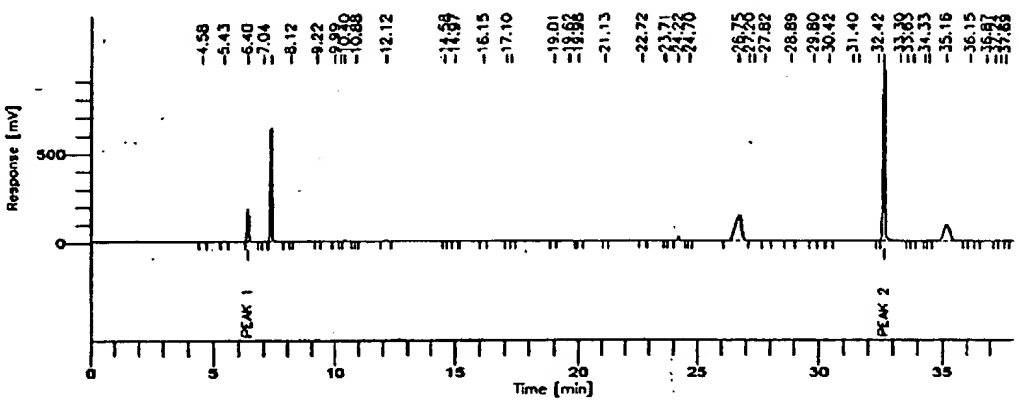
Software Version: 4.0<4J28>
Date: 5/5/98 02:08 PM
Sample Name : Blank
Data File : C:\TC4\HP210\MY05005.RAW Date: 5/5/98 12:08 PM
Sequence File: C:\TC4OLD\HP210\MY05.SEQ Cycle: 5 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		2.531	220.50	0.01
2		4.630	2765.00	0.09
3		5.497	880.34	0.03
4		6.163	532.66	0.02
5	peak 1	6.451	1531.00	0.05
6	peak 2	7.384	392.00	0.01
7		7.764	293.00	0.01
8		7.877	217.00	0.01
9		8.331	164.50	0.01
10		8.883	359.00	0.01
11		9.077	255.38	0.01
12		9.646	1118.62	0.04
13		20.988	13301.50	0.45
14		24.547	38775.96	1.31
15		24.956	4804.04	0.16
16		25.558	19220.00	0.65
17		27.244	1776561.00	60.11
18		28.947	4845.00	0.16
19		29.892	1725.00	0.06
20		30.786	1475.00	0.05
21		32.163	2189.31	0.07
22	Peak 3	32.731	6240.69	0.21
23		33.483	2329.61	0.08
24		33.671	3667.39	0.12
25		34.127	221.00	0.01
26		34.558	900.00	0.03
27		35.714	1063544.50	35.99
28		37.367	2864.00	0.10
29		37.953	3895.00	0.13
			2955288.00	100.00

FIGURE 4.10: The subsequent print-out of the TDC tests at 2.08 p.m. on the background which confirms the anomalous adhesion of magnecules.

Software Version: 4.0<4J28>
Date: 5/8/98 12:21 PM
Sample Name : Mixture bottom H2O layer 500ul
Data File : C:\TC4\HP210\MY08004.RAW Date: 5/8/98 11:32 AM
Sequence File: C:\TC4\HP210\MY08.SEQ Cycle: 4 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



DEFAULT REPORT

Peak #	Component Name	Time [min]	Area [µV-s]	Area [%]
1		4.583	3494.00	0.03
2		5.433	16221.50	0.12
3	peak 1	6.404	792172.00	5.94
4		7.039	16982.00	0.13
5		7.325	2550078.00	19.12
6		8.124	630.00	0.00
7		9.220	415.00	0.00
8		9.985	627.00	0.00
9		10.230	309.00	0.00
10		10.398	30885.50	0.23
11		10.877	298.50	0.00
12		12.123	39988.00	0.30
13		14.575	241.00	0.00
14		14.967	986.50	0.01
15		16.152	365.00	0.00
16		17.103	2121.00	0.02
17		17.308	924.00	0.01
18		19.011	267.50	0.00
19		19.619	4481.50	0.03
20		19.981	428.00	0.00
21		21.133	2269.00	0.02
22		22.716	613.00	0.00
23		23.708	214.00	0.00
24		24.220	81808.50	0.61
25		24.704	168.50	0.00
26		26.751	2431379.65	18.23
27		27.197	8519.35	0.06
28		27.396	589.00	0.00
29		27.819	405.00	0.00
30		28.890	2294.00	0.02
31		29.804	752.00	0.01
32		30.417	607.50	0.00
33		31.395	21039.50	0.16
34		31.648	1279.00	0.01

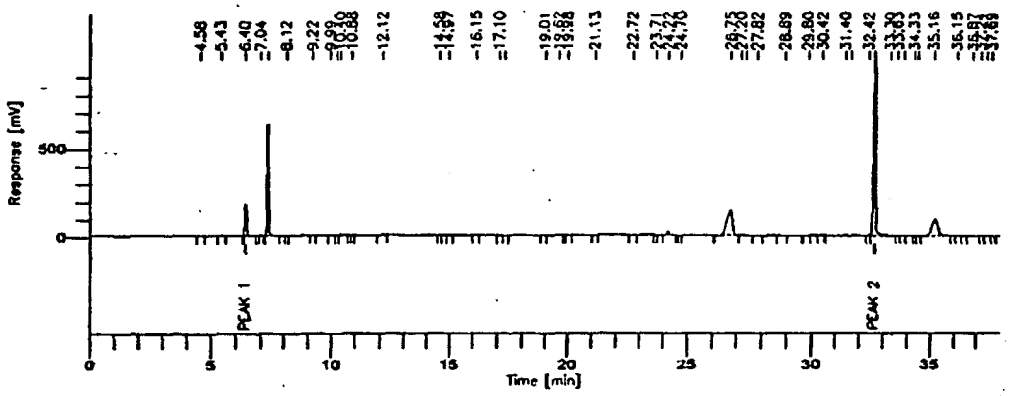
1,804,031 - 5,804,035

Result File : MY08004.RST, Printed On 5/8/98 12:21 PM page 2

Peak #	Component Name	Time [min]	Area [μV·s]	Area [%]
35		32.420	30869.65	0.23
36	peak 2	32.650	5704719.54	42.77
37		33.298	22792.00	0.17
38		33.629	4363.61	0.03
39		33.849	2192.20	0.02
40		34.329	146.22	0.00
41		34.476	841.46	0.01
42		35.160	1547684.32	11.60
43		36.148	1621.00	0.01
44		36.868	2830.75	0.02
45		37.244	577.25	0.00
46		37.506	3180.55	0.02
47		37.691	1038.45	0.01
			13336712.00	100.00

FIGURE 4.11: The ***first spectroscopic experimental evidence of the mutation of magnecules in liquids*** achieved on May 8, 1998, at 12.21 p.m., by analysts ***Brian Wallace*** and ***Mia Burnett*** and her associates at TDC. The scan deals with the magnetically treated combination of GR fragrance oil "mixture 2" and tap water with: a first peak at 6.404 min for 5.94 %; a second peak at 7.325 min for 19.12 %; a third peak at 26.751 min for 18.23 %; a fourth peak at 32.650 min for 42.77 %; and a fifth peak at 35.160 min for 11.60 %; totaling 97.66 %. The mutation is established by the comparison of this scan with the preceding ones.

Software Version: 4.0<4J28>
Date: 5/11/98 08:07 AM
Sample Name : Mixture bottom H2O layer 500ul
Data File : C:\TC4\HP210\MY08004.RAW Date: 5/8/98 11:32 AM
Sequence File: C:\TC4\HP210\MY08.SEQ Cycle: 4 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



DEFAULT REPORT

Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		4.583	3494.00	0.03
2		5.431	16223.50	0.12
3	peak 1	6.404	792172.00	5.94
4		7.039	16982.00	0.13
5		7.325	2550078.00	19.12
6		8.124	630.00	0.00
7		9.220	415.00	0.00
8		9.985	627.00	0.00
9		10.230	309.00	0.00
10		10.398	30885.50	0.23
11		10.877	298.50	0.00
12		12.123	39988.00	0.30
13		14.575	241.00	0.00
14		14.967	986.50	0.01
15		16.152	365.00	0.00
16		17.103	2121.00	0.02
17		17.308	924.00	0.01
18		19.011	267.50	0.00
19		19.619	4481.50	0.03
20		19.981	428.00	0.00
21		21.133	2269.00	0.02
22		22.716	613.00	0.00
23		23.708	214.00	0.00
24		24.220	81808.50	0.61
25		24.704	168.50	0.00
26		26.751	2431379.65	18.23
27		27.197	8519.35	0.06
28		27.396	589.00	0.00
29		27.819	405.00	0.00
30		28.890	2294.00	0.02
31		29.804	752.00	0.01
32		30.417	607.50	0.00
33		31.395	21039.50	0.16
34		31.648	1279.00	0.01

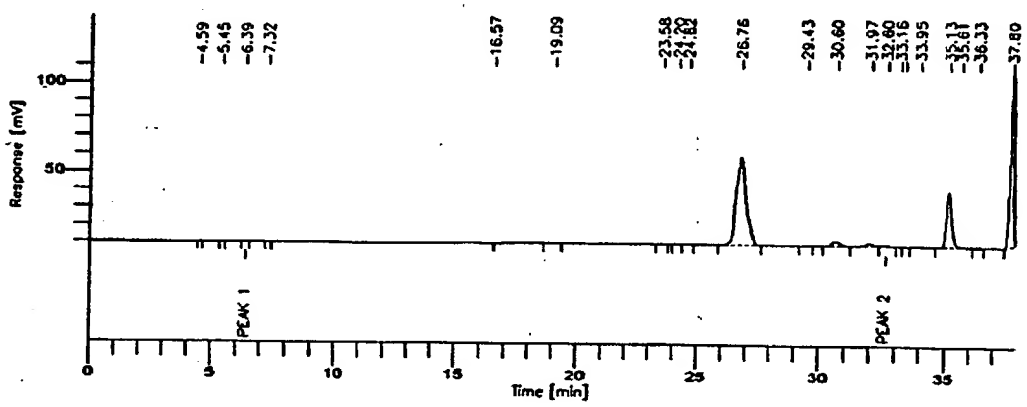
EXHIBIT 2005-0005

Result File : ~RST2255.RST, Printed On 5/11/98 08:07 AM page 2

Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
35		32.420	30869.65	0.23
36	peak 2	32.650	5704719.54	42.77
37		33.298	22792.00	0.17
38		33.629	4363.61	0.03
39		33.849	2192.20	0.02
40		34.329	146.22	0.00
41		34.476	841.46	0.01
42		35.160	1547684.32	11.60
43		36.148	1621.00	0.01
44		36.868	2830.75	0.02
45		37.244	577.25	0.00
46		37.506	3180.55	0.02
47		37.691	1038.45	0.01
			13336712.00	100.00

FIGURE 4.12: A print-out of the TDC tests on May 11, 1998, at 8.07 a.m. on the magnetically treated combination of GR "Mixture 2" and tap water. Comparison with the preceding scans provides additional confirmation of the mutation of magnecules.

Software Version: 4.0<4J28>
Date: 5/11/98 08:08 AM
Sample Name : Blank
Data File : C:\TC4\HP210\MY08006.RAW Date: 5/8/98 01:02 PM
Sequence File: C:\TC4\HP210\MY08.SEQ Cycle: 6 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



DEFAULT REPORT

Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		4.587	2121.00	0.07
2		5.445	607.00	0.02
3	peak 1	6.394	568.50	0.02
4		7.321	269.00	0.01
5		16.567	212.50	0.01
6		19.085	4509.00	0.14
7		23.578	1010.00	0.03
8		24.197	1671.22	0.05
9		24.615	3891.78	0.12
10		26.755	1407266.00	43.59
11		29.425	3670.00	0.11
12		30.597	63266.66	1.96
13		31.973	49614.67	1.54
14	peak 2	32.600	21457.42	0.66
15		33.156	4631.00	0.14
16		33.346	5647.06	0.17
17		33.947	12421.18	0.38
18		35.131	501128.63	15.52
19		35.612	14386.19	0.45
20		36.329	3586.18	0.11
21		37.804	1126495.00	34.90
			3228220.00	100.00

FIGURE 4.13: A print-out of the TDC tests on May 11, 1998, at 8.08 a.m. on the background which confirms the anomalous adhesion of magnetically polarized liquids.

Comprehensive tests via a very modern equipment for Liquid Chromatographic Mass Spectroscopy (LC-MS) with UltraViolet Detector (UVD) were conducted on the same GR fragrance oil "ING258IN Test 2" of Figures 4.1 and 4.2, on December 1, 1998, by Prof. ***Kenneth G. Furton,*** Chairman, and Prof. ***Piero R. Gardinali, Laboratory Director,*** *DEPARTMENT OF CHEMISTRY* of *FLORIDA INTERNATIONAL UNIVERSITY* (FIU), Miami, Florida. The tests were then repeated on December 117 and 18 by confirming the preceding results.

The tests were conducted under a number of technical charfacterizations specifically selected to detect magnecules, among which I recall:

1) Total Ion Chromatogram (TIC) collected under the positive ion atmospheric pressure electrospray ionization (ESI+) mode;

2) Integrated TIC with retention times and areas for the most abundant peaks;

3) Raw mass spectra for all peaks identified in item 2;

4) HPLC chromatograms collected at fixed wavelength of 254 cm;

5) UV-visible spectra form the HPLC diode array detector from 230- to 700 mm.

The tests were conducted on the following samples:

A) Sample GR331, the magnetically untreated, fully transparent GR fragrance oil "ING258IN Test 2";

B) Sample GR332, magnetically treated "ING258IN Test 2" with 10 % DiproPylene Glycol (DPG);

C) Sample GR332S, bottom layer of the preceding sample;

D) Sample GR335, magnetically treated mixture 4 % GR fragrance oil "ING258IN Test 2", 0.4 % DPG and 95 % tap water;

E) Sample GR335O, visible dark clusters in the preceding sample.

To avoid a prohibitive length of this presentation, in the following I only reproduce ten main print-out of the comprehensive and detailed documentation obtained at FIU (which is available in its entirety as Appendix V of Ref. [3f]).

Inspection of the print-outs (as well as the comprehensive documentation) shows that ***the tests conducted at FIU on GR fragrance oil "ING258IN Test 2" provide conclusive experimental evidence on the existence of magnecules in liquids.***

EDS00452-52E5E5E0

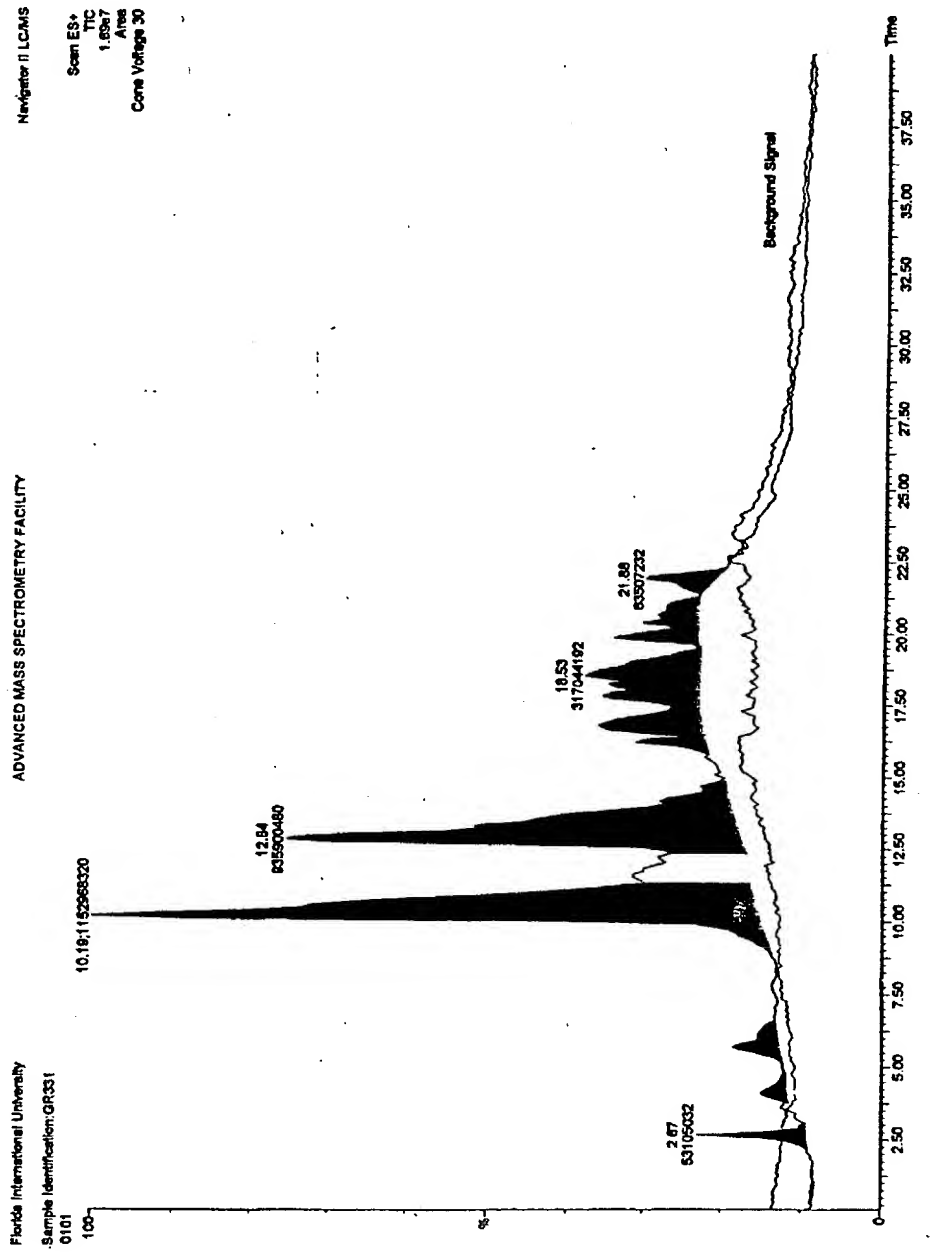


FIGURE 4.14: FIU scan on the untreated GR oil "1NG258IN Test 2" of Figs. 4.1, 4.2.

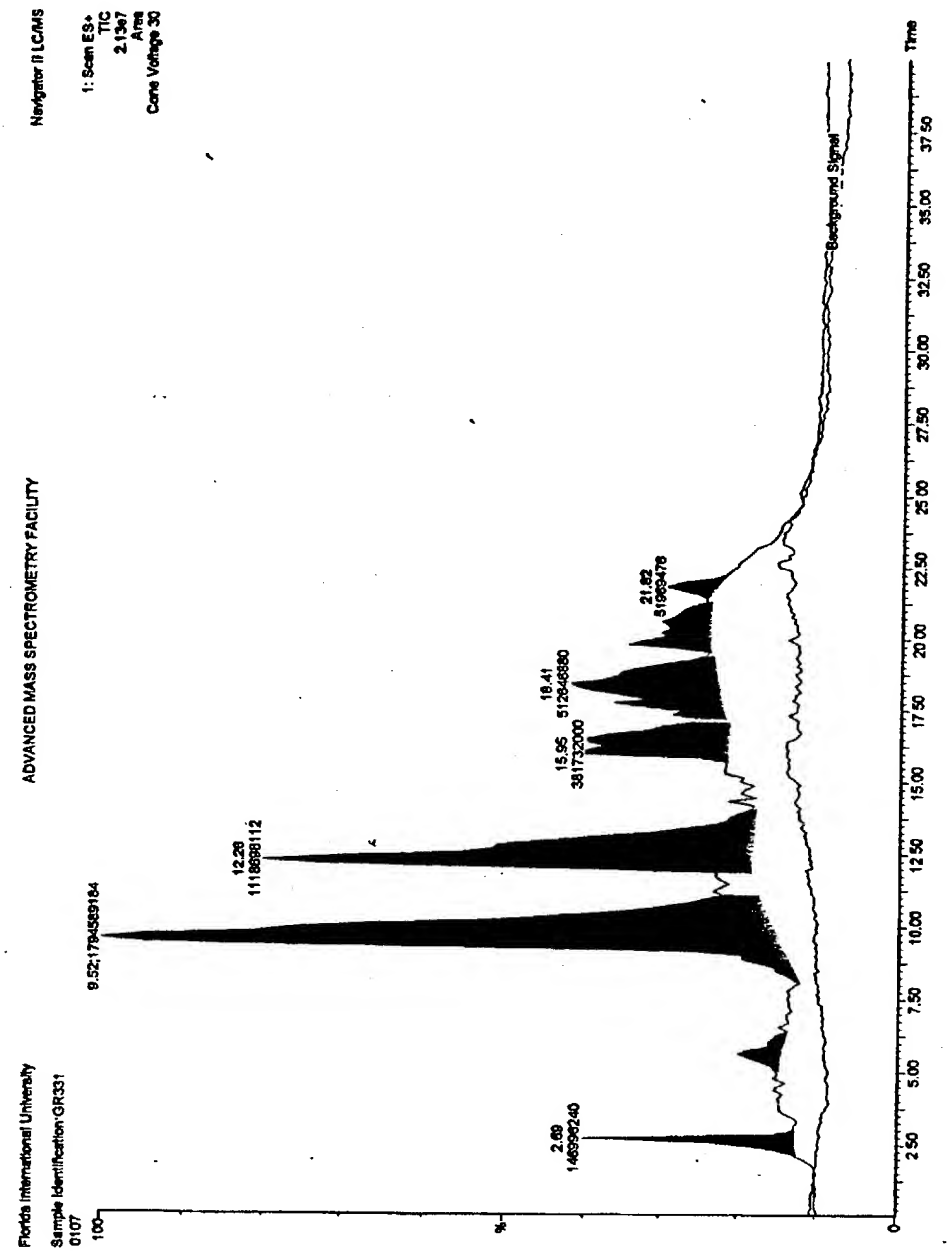


FIGURE 4.15: Confirmation of the preceding chemical structure.

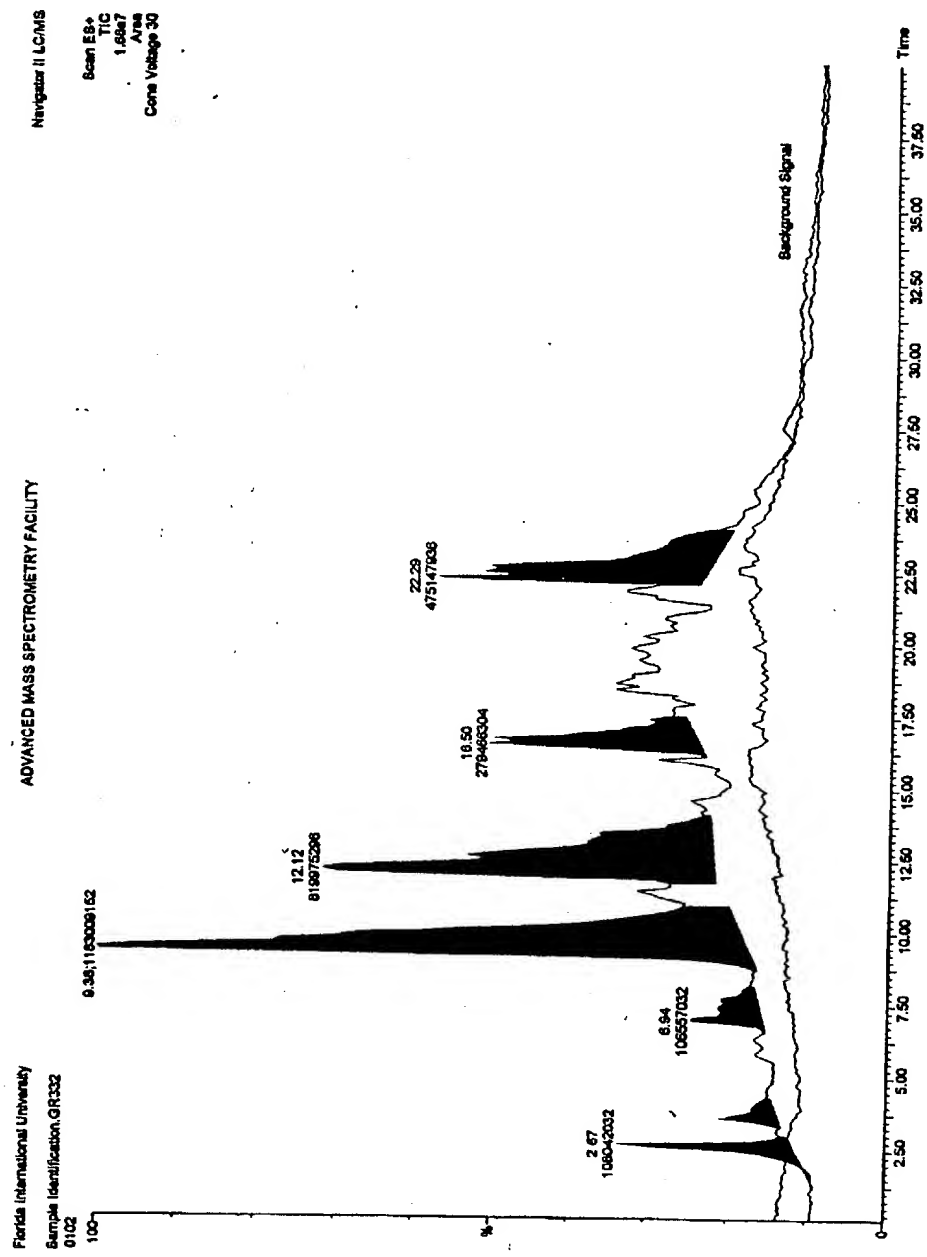


FIGURE 4.16: FIU scan on the chemical structure of the magnetically treated GR oil "ING258IN Test 2" with 10% DPGF. Note the initiation of the ***appearance of new peaks.***

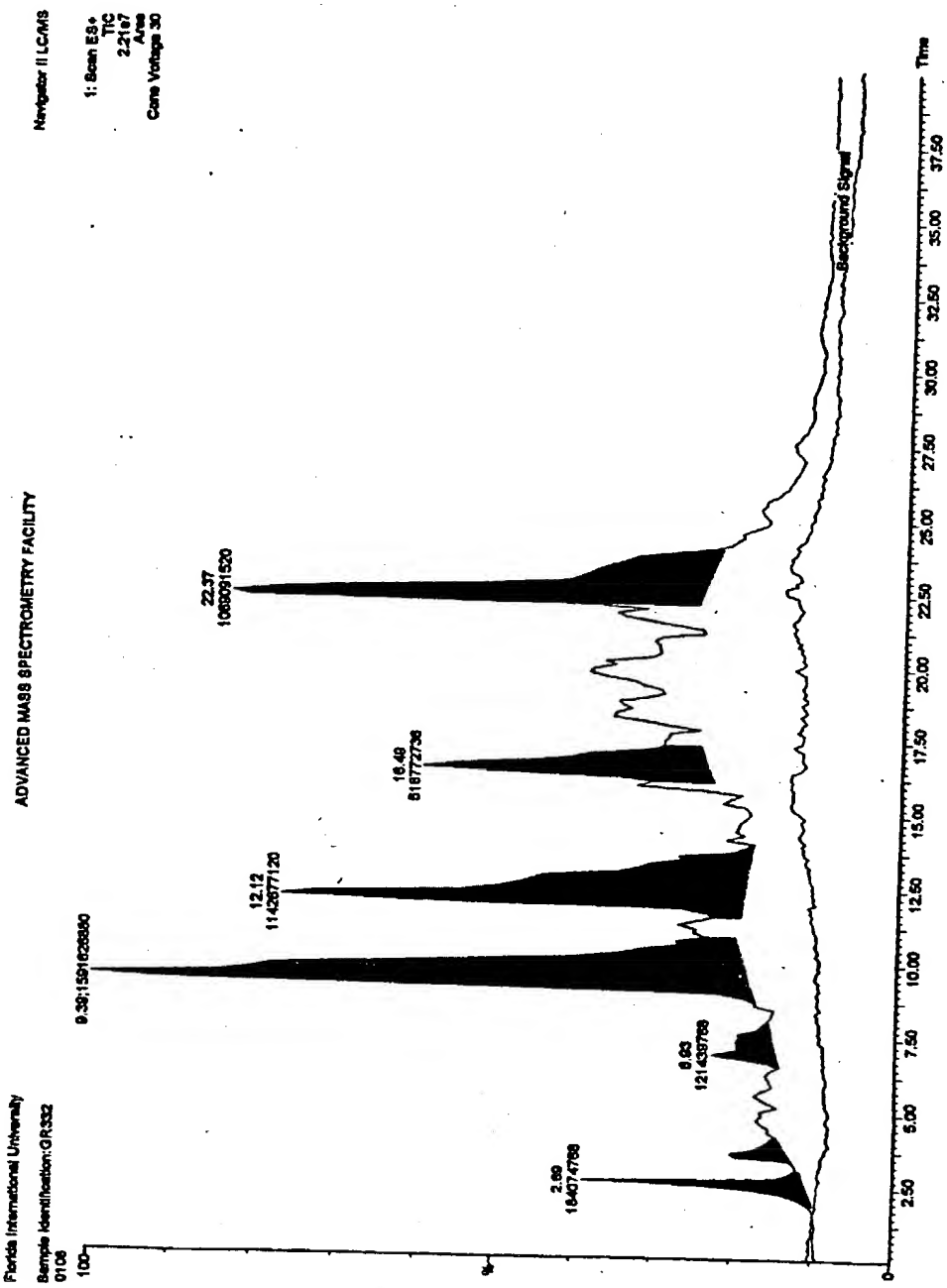


FIGURE 4.17: FIU scan on the chemical structure of the magnetically treated GR oil "1NG258IN Test 2" with 10% DPGF. Note the ***large new peak on the r.h.s.***

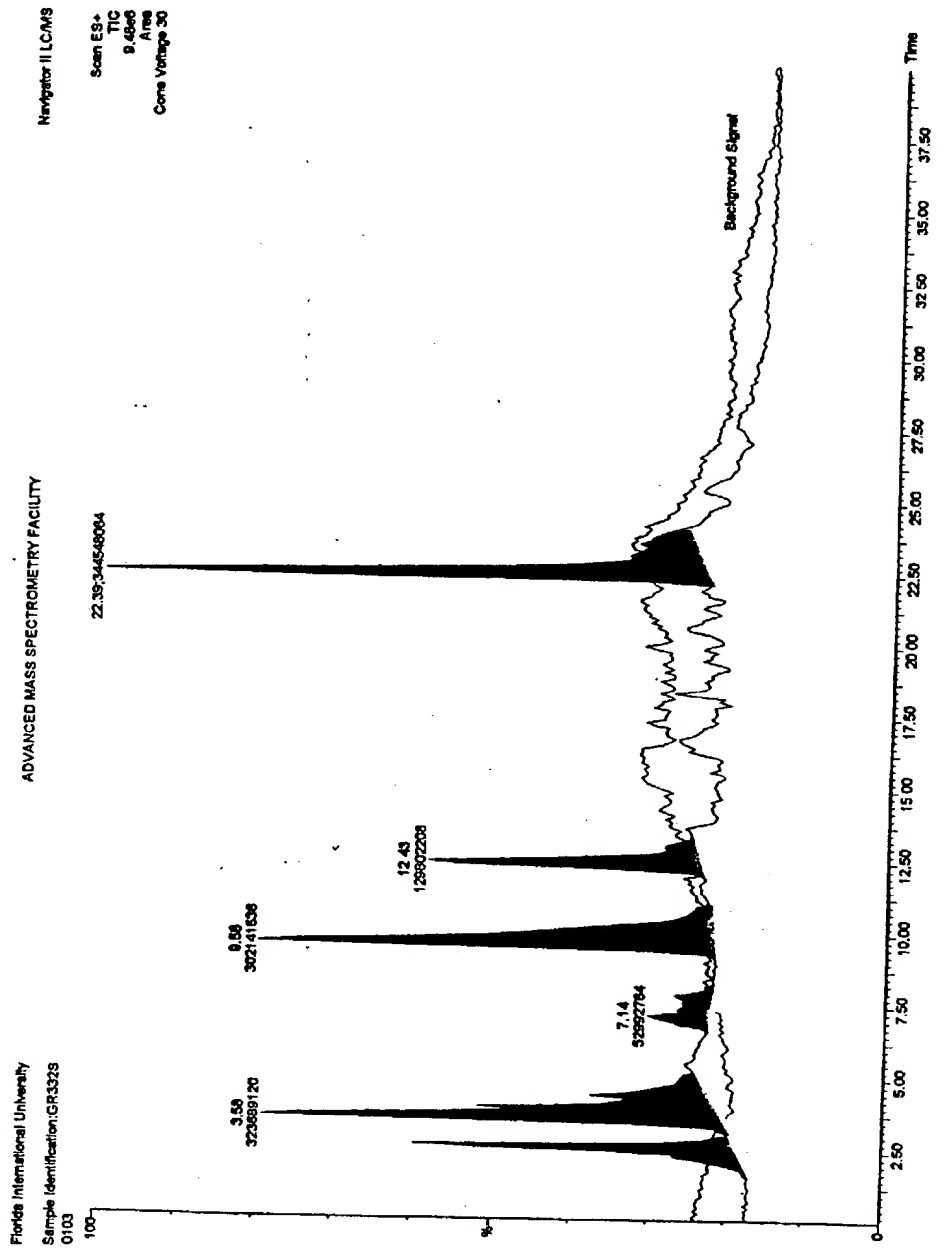


FIGURE 4.18: FIU scan on the chemical structure of the bottom layer of the sample of the preceding print-out. Note the ***large increase of the new peak in the r.h.s.***

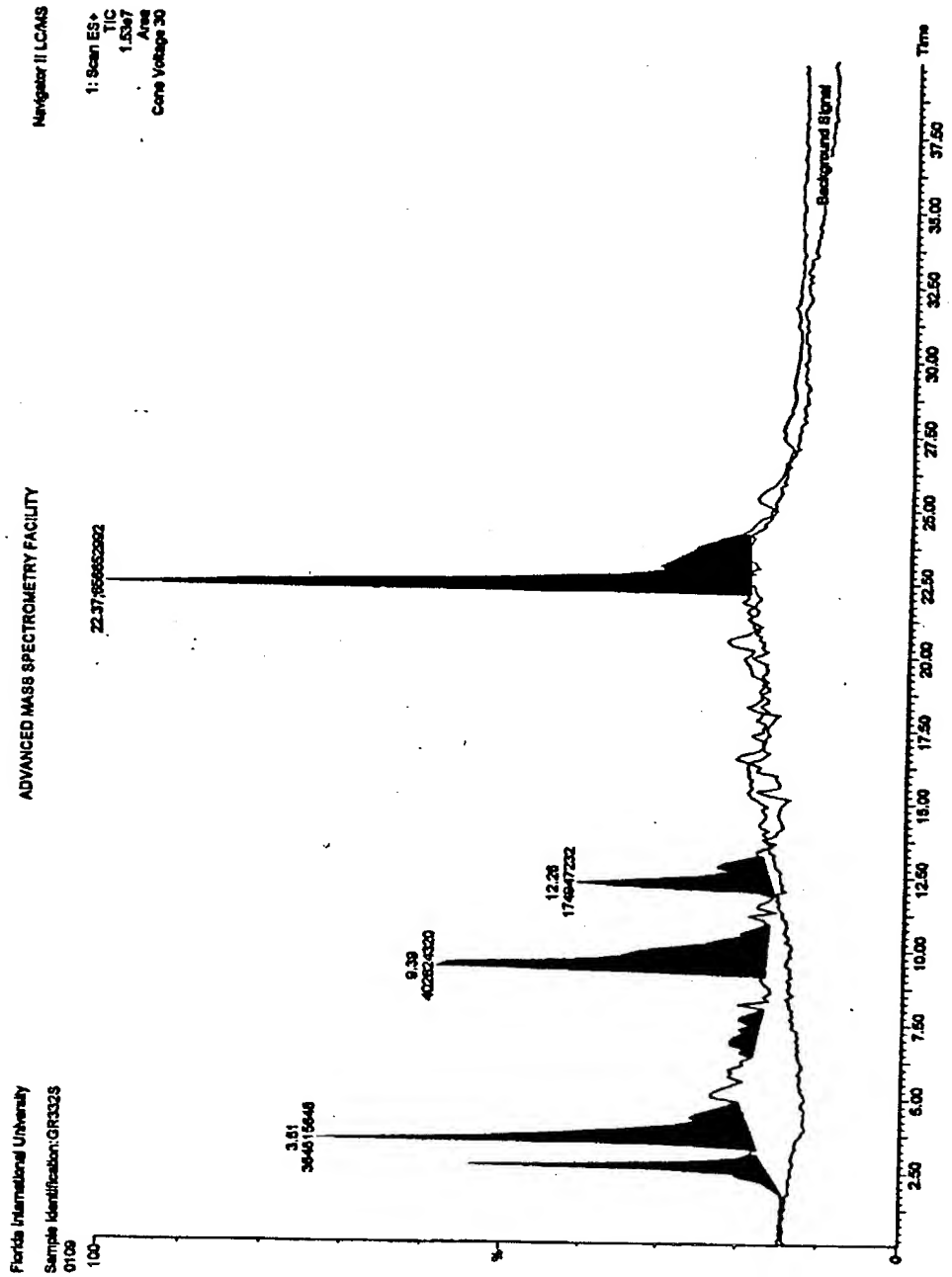


FIGURE 4.19: Confirmation of the preceding results.

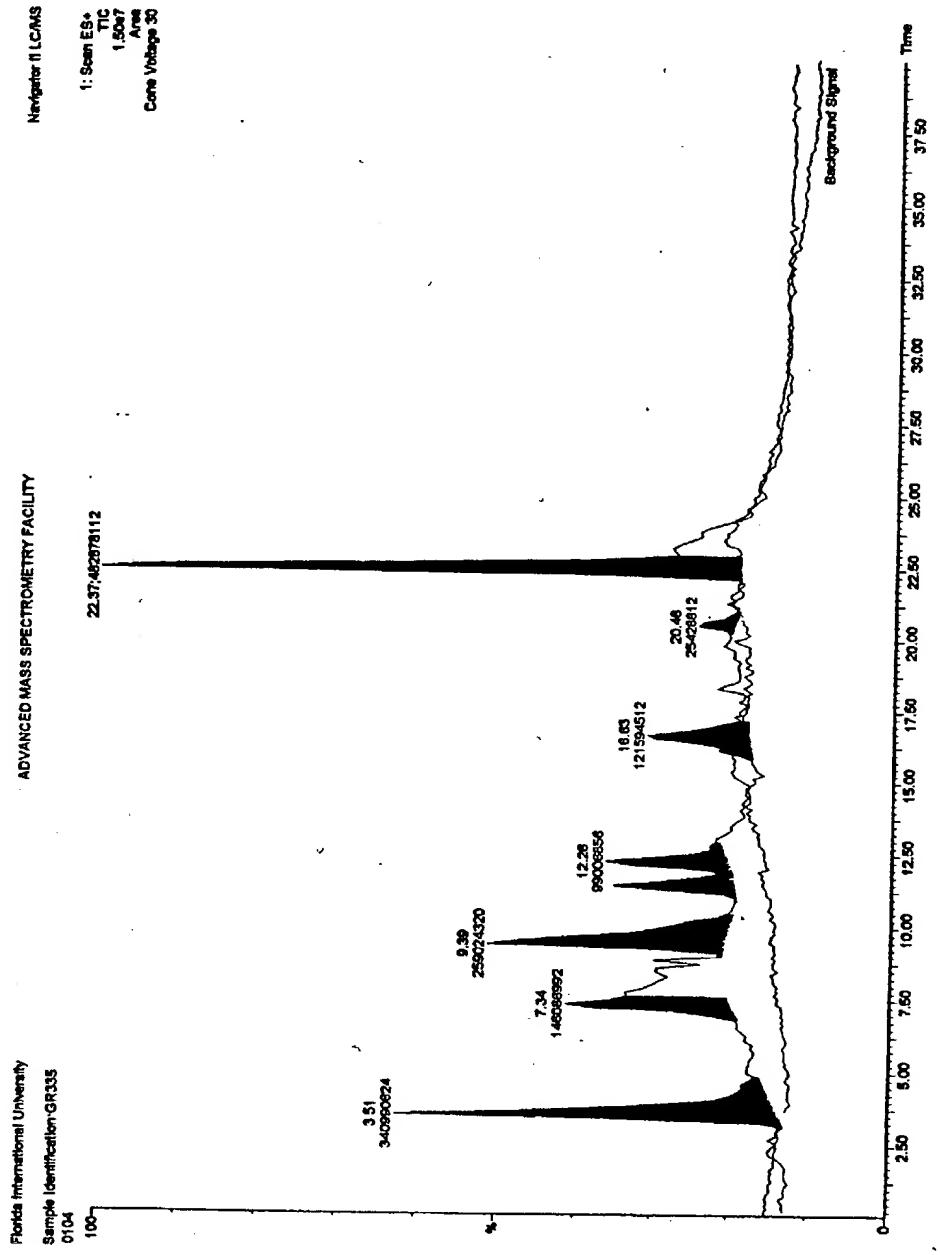


FIGURE 4.20: FIU scan on the magnetically treated 4 % GR oil "ING258IN Test 2", 0.4 % % DPG and 95 % tap water. Note ***the persistence of the large new peak in the r.h.s.***

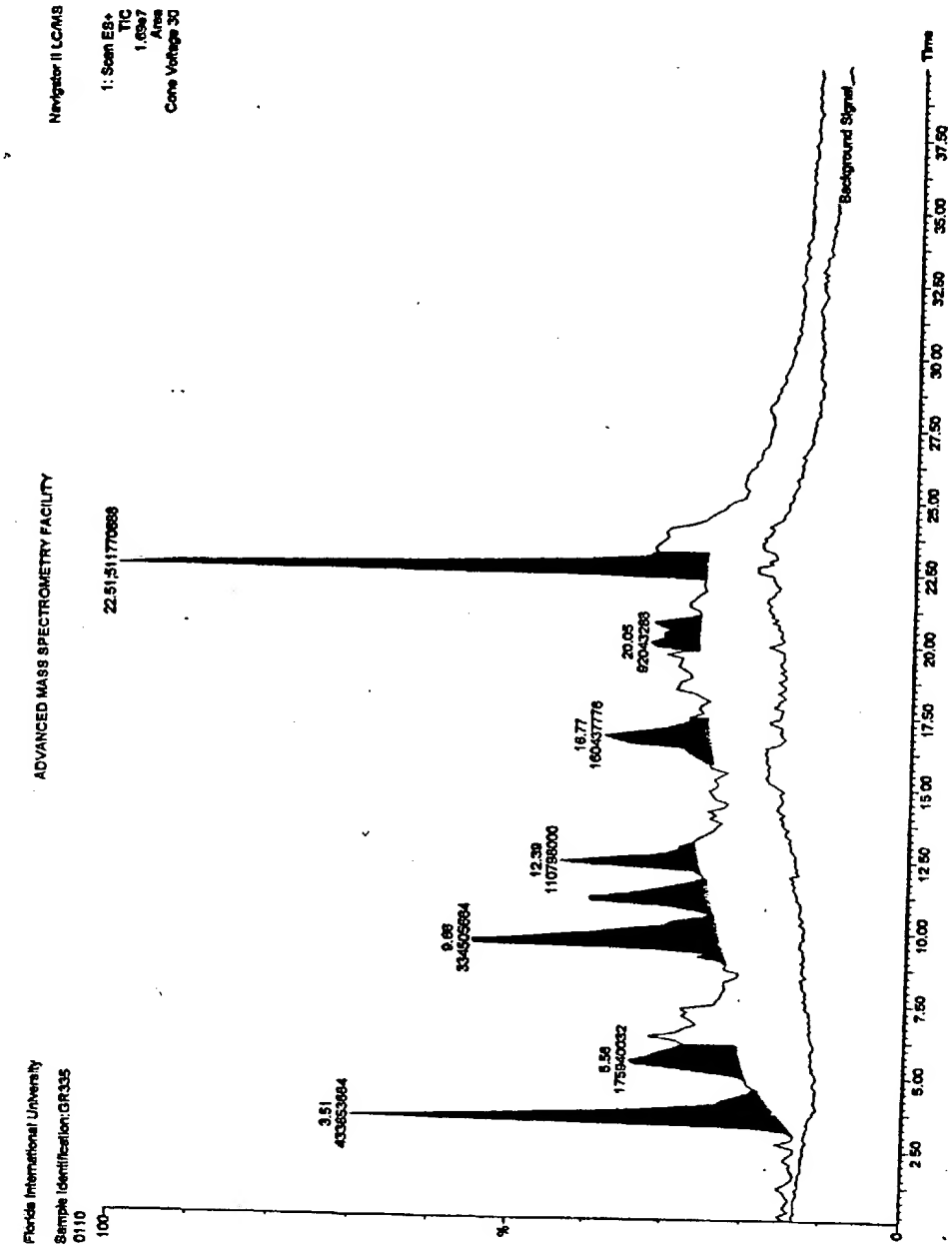


FIGURE 4.21: Confirmation of the preceding results.

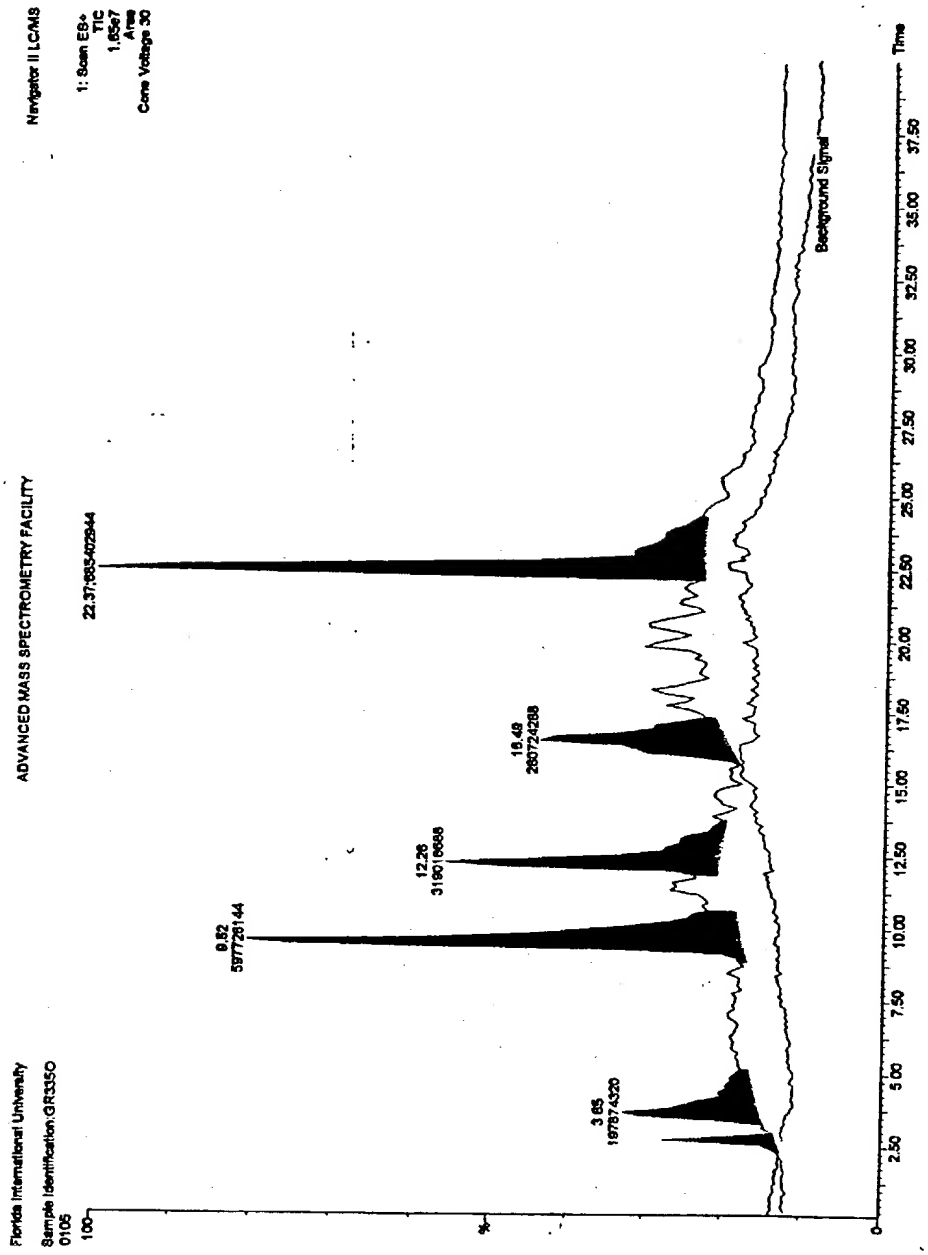


FIGURE 4.22: FIU scan on the large dark structures in the samples of the preceding print-out. Note the ***persistence again of the large new peak in the r.h.s.***

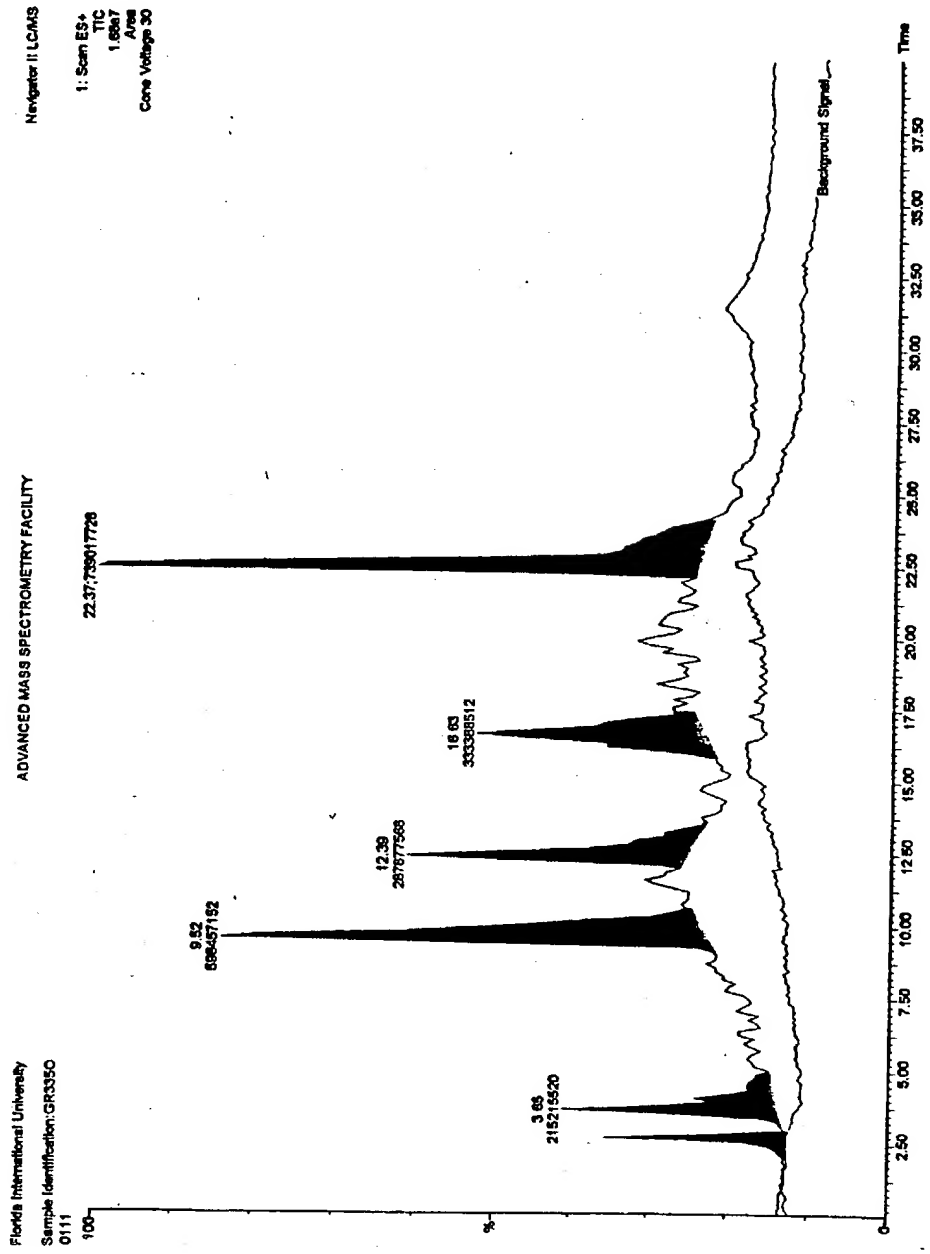


FIGURE 4.23: Additional confirmation of the preceding results.

4.4. Magnetic mutations of physical characteristics in liquids. The existence of magnecules in liquids implies necessary alterations, called *mutations,* of physical characteristics, such as increase of the specific density and viscosity. This is due to the fact that magnetic bonds among ordinary molecules imply an evident reduction of intermolecular distances, thus resulting in more molecules per unit volume as compared to the magnetically untreated liquid. The increase in viscosity is then consequential.

The reader should be aware up-front that I am not referring to esoteric changes in minute amounts, but rather to large macroscopic alterations often visible to the naked eye, which are at times such to alter completely the original state, as it was the case the complete loss of transparency and fluidity in the magnetically treated oils of Figures 4.3.

At a deeper level, it appears that the mutation of physical characteristics are due to various contributions, such as :

1) the elimination under a suitable magnetic field of (at least some of the) rotational motions of the molecules which, per se, implies a decrease of their average volume with consequential increase of the specific density;

2) the polarization of the orbits of the valence electrons which imply an additional decrease of the average molecular volume and consequential increase of the specific density, viscosity and other characteristics; and

3) the magnetic bond among different molecules which implies additional contributions to the indicated mutations.

In this section I report direct experimental evidence on measurements of specific density, viscosity and other characteristics which confirms the above prediction.

In all samples I used ordinary tap water and a number of GR fragrant oils. All samples here considered were prepared by conventionally mixing tap water and one fragrant oil and then submitting that mixture to rather weak permanent magnets of 200 G (much weaker than those used for Pictures 4.1 and 4.2) via an equipment protected by patent applications I am not at liberty to disclose at this time. All samples resulted to be very stable without any measurable change over a period of about year.

In early 1998 I prepared various samples along the above procedure numbered from 1 to 25. The measurements of the specific density were conducted on March 9, 1998 by analyst Dr. ***A. Sibille*** at the *SGS U.S. TESTING COMPANY, INC.* (USTC) of Fairfield, New Jersey under assistance by Mr. ***Lawrence Perovetz,*** President of *Millennium Corporation* (MC) of largo, Florida. The

results of the tests are presented in the following figure.

Sample 1 is ordinary untreated tap water. Sample 2 is ordinary tap water magnetically treated for about 5 minutes. Samples 3 and 4 were tap water treated with other magnetic equipment. Sample 5 was ordinary untreated GR fragrance oil received under the code of "APC Fragrance". Sample 6 was a mixture of fragrance oil 5 with tap water magnetically treated for about 5 minutes. Mixtures 7 and 8 were the same mixture 5 although treated with other equipment. Magnetically treated fragrance 17 was a GR oil received under the code "Air Freshener 1". Mixture 19 was Fragrance 17 with tap water 16 magnetically treated for 5 minutes. Note that all measurements of the following figure were done to an accuracy of the fourth digit. Therefore, numerical results up to the third digit can be considered accurate.

In the transition from Sample 1 [untreated water] to Sample 2 [magnetically treated water] there is an increase of the specific density in the macroscopic amount of 0.86% thus confirming the indicated magnetic mutation of water.

In turn, the increase in density clearly supports the existence of magneplexes in magnetically treated water, as detected earlier.

As well known, fragrance oils are (generally) *lither* than water, i.e., the specific density of the untreated fragrance in Sample 5 is *smaller* than that of the untreated water in Sample 1. According to quantum chemistry, the specific density of any mixture of the above two liquids, whether solution, suspension or dispersion, must be *in between* the lither and heavier specific densities.

On the contrary, as one can see in the following figure, ***the specific density of the magnetically treated mixture of GR "APC fragrance 1" with tap water, Sample 6, resulted to be bigger than that of the densest liquid, the water. This measurement constitutes additional, rather strong, direct experimental verification of the magnetic mutation of physical characteristics in liquids.***

The reader should be made aware that the above anomaly (a mixture of two liquids whose specific density is bigger than that of the heaviest of the two) *cannot* be explained via conventional quantum chemical knowledge. The presentation of scientifically credible opposing views is here solicited.

On the contrary, the anomaly is theoretically predicted and quantitatively treatable by the covering hadronic chemistry [3] via the creation of magnecules.

A remarkable point is that the ***magnetic mutations of density are macroscopically large.*** In fact, they were called by an analyst "UPS-type anomalies", meaning that the shipment via UPS of a given volume of a magnetically treated liquid requires an increase of the shipping cost due to the

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macroscopic increase of the weight.

A further prediction of magnetically polarized liquids is the increase of its viscosity . This is evidently due to the arbitrary size of an individual magnecule, as well as the tendency of the same to bond near–by molecules, resulting in accretions, not mention the anomalous adhesion to the walls of the container which has been systematically detected for all magnetically polarized liquids.

As indicated earlier, in certain cases the increase of viscosity is so large to be first visible to the naked eye and, when the treatment is sufficiently protracted, the increase of viscosity is such to lose the customary liquid mobility.

Ordinary engine oils are particularly suited for magnetic treatment because their increase in viscosity is so dramatic to be rapidly visible to the naked eye jointly with a visible, also dramatic change in visual appearance (color, texture, opacity, etc.).

The measurements on viscosity are reported in a subsequent figure. They were done on March 9, 1998 by analyst **J. R. Tyminski** at *SGS U.S. TESTING COMPANY, INC.* of Fairfield, New Jersey, under assistance by *MILLENNIUM CORPORATION.* The selected engine oil was an ordinarily available 30–40 Castrol Motor Oil subjected to magnetic treatments via two different equipment called of Type A and B. All treatments were done at ordinary conditions in the outsider of the oil container without any additive or change of conditions of any type.

An one can see, ***measurement 2 shows a dramatic increase of the viscosity in the magnetically treated oil of 44.5% as compared to the viscosity of the untreated oil, while measurement 3 shows an increase in viscosity of 51.2%.***

The above experimental results evidently provide additional support for the the existence of magnecules.

The tests on viscosity also provide evidence of the anomalous adhesion of liquids with magnecules which is establishes in this case by a dramatic, macroscopic increase of adhesion of the oil to the walls of the glass container visible by the naked eye.

The same macroscopic anomaly is confirmed at the microscopic level. During the measurement of viscosity there was such an anomalous adhesion of the magnetically treated oils to the walls of the instrument that could not be removed via routine cleaning with acetone and required the use of strong acids.

This anomalous adhesion is further experimental evidence on the existence of magnecules because of their predicted capability to induce the polarization of the orbits of the valence electrons of the atoms in the walls of the container, thus resulting in anomalous adhesion via magnetic bonds due to induction.

Document #: 2005-P-00005

REPORT OF TEST

SGS U.S. Testing Company Inc.
291 Fairfield Avenue
Fairfield, NJ 07004-3833
Tel: 973-575-5252
Fax: 973-244-1694

Report Number: 103947

Millennium Results

Density of	g/mL	% Change Density vs Ordinary Water
Sample #1	0.9805	0
Sample #2	0.9889	+0.86
Sample #3	0.9804	0
Sample #4	0.9853	+0.49
Fragrant #5	0.9720	NA
Mixture #6	0.9967	+1.65
Mixture #7	0.9982	+1.80
Mixture #8	0.9902	0.99
Treated Water #16	0.9893	0.89
Frag Treated # 17	0.9453	NA
Mixture #18	0.9902	0.99
Mixture #19	0.9929	1.28

Samples were transferred to a separatory funnel. The layers were allowed to separate. The water layer was withdrawn into a funnel with Whatman #4 filter paper. The filtrate was transferred to a preweighed 10 mL volumetric flask. The sample was weighed to 0.0001 grams and the density calculated.

When the samples were pure substances, they were transferred directly to preweighed 10 mL volumetric flasks.

Calculations:

Weight flask with sample - weight flask ÷ volume of flask = g/ mL

Arlyn Sibille, Ph.D.

FIGURE 4.24: USTC measurements of specific density on magnetically treated liquids.

REPORT OF TEST

SGS U.S. Testing Company Inc.
291 Fairfield Avenue
Fairfield, NJ 07004-3833
Tel: 973-575-5252
Fax: 973-244-1694

Report Number: 103947
Date: 03/09/98
Page: 1 of 1

SUBJECT: Three (3) samples received on 02/09/98

PURPOSE: Determine the density and viscosity of the three samples.

TEST DATE: 02/25/98

PROCEDURE: Three 10 milliliter volumetrtic flasks were pre-weighed. One of the samples was transferred to each of the volumetric flasks with a pipet. The samples were weighed again. The density of each sample was calculated.

The three oil samples were measured for viscosity using a Kinematic viscometer (ASTM D-445).

RESULTS:

Sample Identification	Density, g/mL)	Viscosity (cps)	Increase Viscosity, %
1) Motor Oil, "as is"	0.8682	199.8	0
2) Motor Oil, Treatment Type A	0.8714	288.7	44.5
3) Motor Oil, Treatment Type B	0.8689	302.0	51.2

SIGNED FOR THE COMPANY BY:

James R. Tyminski
Laboratory Supervisor

Arlyn Sibille, Ph.D.
Laboratory Director

/mo

Member of the SGS Group
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FIGURE 4.25: USTC measurements of viscosity on magnetically treated liquids.

It is evident that the magnetic mutations of density and viscosity implies the expected mutation of *all* other physical characteristics of the liquid considered. Measurements along these lines are solicited (see next section).

The existence of mutation of *physical* characteristics then implies the mutation of *chemical* features. At this moment I can indicate the visual evidence reported by the analysts of USTC according to whom the reaction of magnetically treated oils with acetone is dramatically different than that with untreated oil, beginning with a visual mutation in color, texture and other appearances. I am not at liberty at this moment to report additional evidence of chemical anomalies.

More importantly, the reader should be aware that ***chemical reactions of magnetically polarized liquids are predicted to experience a mutation of their thermodynamical behavior, resulting in certain case in an increase of calories per mole.***

Systematic studies on chemical mutations are under way and they will be reported at some future time.

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4.5. Examples of industrial applications of magnetically polarized liquids. It is evident that ***all the anomalies in liquids identified in this section have novel industrial applications in a variety of fields, including, but not limited to, the fragrance industry, automotive industry, paint industry, adhesive industry, medicine, etc. These applications are under patent pending and other industrial protections.***

Evidently I am not at liberty to disclose these applications in the necessary details at this time. I can nevertheless present below illustrative lines (all under patent pending) that any scientist can easy derive form the indicated anomalies.

Applications to automotive industry, such as: the use in a gear box of a lubricant subjected to an appropriate magnetic treatment implies the presence of sufficient lubrication at start-ups after lack of use. When conventional lubricants are used, non-immersed gears are virtually dry after a few hours of lack of use; the enhancement of energy content and octanes; and others.

Application to paint industry, such as: the use of the increased penetration of magnetically treated liquids within porous surface to produce more efficient and longer lasting paints; or the use of magnetically treated marine paints for hulls of metal ships, which is expected to last longer than conventional paints, evidently. In fact, the magnetically treated paints induce a polarization of the atoms in the metal walls, thus resulting in an anomalous adhesion which is

typical of liquids with magnecules.

Applications to medicine, such as lotions subjected to the magnetic treatment herein considered, which are expected to penetrate the human skin much deeper than the same untreated lotions; or the study of conceivable new forms of local delivery of medications thru the skin (e.g., the deep local penetration of antibiotics in wounds), by therefore avoiding its current delivery to the entire body.

The above (and other) novel applications warrant additional scientific and industrial research and development on magnecules in liquids.

4.6. Evidence of magnecules in solids. In the preceding sections I have presented theoretical and experimental evidence of the existence of magnecules in gases and liquids.

The direct experimental evidence on the existence of magnecules in solids available at this writing is so simple to appear naive.

It is given by the evidence that ***all liquids with magnecules systematically preserve the new species when frozen, as established by the recovering of anomalous features when returning to the liquid state, as well as the preservation at the solid state of opacity and other features.***

Also, magnecules can be directly verified under microscopic observation to persist at the solid state.

Needless to say, the above simplest possible evidence in solids is only the beginning of various possibilities. I merely mention here in depth study on the true chemical composition of *solids created under intense magnetic fields,* such as fullerenes [5] and other composites.

The latter study is under way and I shall report the results in some future paper.

5. CONCLUDING REMARKS

In this memoir I have presented the theoretical prediction and several independent experimental verifications of the existence of a *new chemical species* I submitted under the name of *magnecules,* which is composed by clusters of atoms and molecules under a new strong bond of non-valence type and which is

stable at ordinary conditions.

The reason why this new species was not discovered time ago is the silence throughout this century in the vast literature of both quantum mechanics and chemistry of the magnetic moment created by the orbiting of valence and other electrons.

These magnetic moments are been ignored because of the general distribution in space of the motion of electrons, with consequential impossibility of their detection.

However, one of the most rigorous disciplines of this century, quantum electrodynamics, has established that electron orbits must acquire a polarization in a plane under sufficiently intense external magnetic fields, as well known in atomic physics.

Simple calculations for the hydrogen atom then show that the magnetic moment of its polarized electron orbit is 1,316 times *bigger* than the magnetic moment of the nucleus (the proton).

Such a large value of the orbital magnetic moment then sets the foundations of the new species of magnecules, as well as of the new technology for their production.

Quite remarkable are the variety and amount of alterations, called *mutations*, of physical and chemical characteristics under said magnetic polarization, which provide the foundations for numerous novel industrial applications.

Intriguingly, the results presented in this memoir constitute the most compelling experimental evidence known to me at this time on the *insufficiency* of quantum mechanics for the treatment of the hydrogen and other *molecules*, while being *exact* for the structure of the hydrogen *atom*, as illustrated in Fig. 1.4. The insufficiency of quantum chemistry is then consequential.

In fact, the assumption of quantum mechanics as being exact for molecular structures requires a point-like approximation of overlappings wavepackets of valence electrons, with numerous irreconcilable consequences in disagreement with experimental evidence, such as correlations among an arbitrary number of electrons, prediction of molecules with an arbitrary number of atoms, the ferromagnetic character of all molecules, and other inconsistencies.

The use instead of the covering quantum mechanics and chemistry allows the resolution of the above inconsistencies, by permitting the theoretical prediction and quantitative treatment of the new species of magnecules in a way compatible with experimental data to several digits.

Among the various macroscopic mutations induced by magnetic

Posted 25 April 2004

polarizations, that I consider of fundamental character is the mutation of the infrared signature for gases or ultraviolet signature for liquids established in this paper by various independent chromatographic–spectrometric measurements (see, e.g., Figs. 3.4 and 3.8).

Such a mutation constitutes direct experimental evidence of a *mutation of conventional molecular structures*, because it generally implies the appearance of *new strong internal molecular bonds* which can only originate from the polarization of *internal electrons*, the valence electrons being used for conventional bonds.

In turn, these IR or UV mutations alone offers new scientific, industrial, medical and governmental applications, such as the dramatic increase of energy content reported in Section 3 [6b].

Needless to say, the studies reported in this memoir are at their first infancy and so much remains to be done.

To have an idea of the needed research, the entire current experimental knowledge on water [1c] needs to be reproduced when water is subjected to magnetic polarization. This includes the need to plot the behavior of the specific density, viscosity and other characteristics as a function of the intensity and geometry of the magnetic treatment; the behavior of the electric and magnetic susceptibility under magnetic polarizations; and other features.

Most important is the study of the behavior under sufficiently strong magnetic fields of the characteristic 105^{o} angle of the water between the two HO dimers which has been repeatedly measured for magnetically untreated water.

In principle, following the availability of sufficient theoretical and experimental knowledge, I do not exclude the possibility of the future laboratory construction of a "linearized water molecule", i.e., the molecule $H_2O = H–O–H$ with 180^{o} angle between the two HO dimers.

By remembering the fundamental character of water for most of science, industry, medicine and government, the implications of these studies can well be beyond our predictive capabilities.

It is rewarding for me to note that the use of hadronic mechanics and chemistry offer, for the first time, the possibility of quantitative studies of a variety of physically different configurations of the water molecule which are simply inconceivable, let alone scientifically treatable, via the pre-existing quantum mechanics and chemistry.

All these new advances appear to have opened a new horizon in chemistry which, in view of its diversifications and implications, is beyond the capability of any individual scientist or industry, thus requiring a collegial participation.

Hadronic Journals

Colleagues interested in participating in the ongoing research are encouraged to contact *THE INSTITUTE FOR BASIC RESEARCH* in Palm Harbor, Florida (e–address ibr @gte.net and Web site http://hom,e1.gte.net/ibr), and inquire about open theoretical, experimental or applied, and physical, chemical or industrial research problems and the related availability of financial support.

Acknowledgments

I have no words to express my sincere appreciation, esteem and gratitude to Professor ***Donald D. Shillady*** of the *DEPARTMENT OF CHEMISTRY* of *VIRGINIA COMMONWEALTH UNIVERSITY* in Richmond, Virginia, for his vision, dedication to the pursuit of new scientific knowledge, vast chemical expertise and continued suggestions, which permitted the recent construction of the hadronic chemistry, without which magnecules would have had no scientific foundations.

This memoir has also seen the light of the day because of the personal commitment, industrial vision, maturity of judgment and dedication to advanced technologies by Mr. ***Leon Toups,*** President of *TOUPS TECHNOLOGY LICENSING CORPORATION,* of Largo, Florida, to whom I have no words to express my appreciation, esteem and gratitude. It is a truism to state that, without his financial, logistic and industrial assistance, the discovery of magnecules would have been impossible.

Additional thanks are due to all other TTL members, including but not limiting to Mr. ***Mark Clancy,*** Mr. ***Michael Toups*** and Mr. ***Jerry Kammerer,*** Vice Presidents, Mr. ***William H. Richardson, jr.,*** Mr. ***Ken Lindfors,*** Mr. ***Andy Karpay,*** Mr. ***Jack Hansen,*** Mr. ***David McKinnon,*** Mr. ***Richard A. Lyons,*** Mr. ***Paul-John Normand*** Mr. ***Doug Palmer,*** Mr. ***James Wilcox,*** and others, for truly invaluable assistance in the difficult task of measuring physical anomalies.

Additional thanks are due to several executives and scientists at *GIVAUDAN–ROURE CORPORATION,* with headquarters in Teaneck, New Jersey, including but not limiting to: Mr. ***Andrew J. Herskee,*** Senior Vice President; Dr. ***Thomas McGee,*** Senior Vice President for; Mr. ***Kenneth L. Purzycki,*** Director of Fragrance Science; Dr. ***Konrad Lerch,*** Senior Vice President and Director of Corporate Research Laboratories in Dubendorf, Switzerland; and other GR members.

Further thanks are due to Mr. ***Lawrence Perovetz,*** President of *MILLENNIUM CORPORATION* (MC) of Orlando, Florida, for continued encouragement and assistance.

encouragement and assistance.

Additionally, I have no words to express my appreciation and gratitude to numerous independent analysts who,. by conducting various measurements on expected anomalies, proved to be real scientists. Among them I acknowledge measurements conducted by the following analysts under support from *TOUPS TECHNOLOGY LICENSING:*

> Analysts ***Louis A. Dee,*** Branch Manager, and ***Norman Wade*** of the branch of *NATIONAL TECHNICAL SYSTEMS* located at *MCCLELLEN AIR FORCE BASE* in North Highland, California;

> Analyst ***Kevin Lothridge*** of the *NATIONAL FORENSIC SCIENCE TECHNOLOGY CENTER,* in St. Petersburg, Florida;

> Analyst ***David Fries*** of the *OCEAN TECHNOLOGY CENTER* of *FLORIDA INTERNATIONAL UNIVERSITY* in St. Petersburg, Florida;

> Dr. ***N. Palibroda*** and Dr. ***P. Glueck*** of the *INSTITUTE FOR ISOTOPIC AND MOLECULAR TECHNOLOGIES* of Cluj-Napoka, Romania;

> Analysts ***Brain Wallace*** and ***Mia Burnett*** at the *TEKMAR-DOHRMAN CORPORATION* of Cincinnati, Ohio;

> Professors ***Kenneth G. Furton*** and ***Piero R. Gardinali*** of the Chemistry Department of the *FLORIDA INTERNATIONAL UNIVERSITY* of Miami;

> Professor ***M. Fetterolf*** of the *DEPARTMENT OF CHEMISTRY* of the *UNIVERSITY OF SOUTH CAROLINA* in Aiken;

> Dr. ***Arlyn Sibille*** and analyst ***James R., Timinski*** of the *SGS U. S. TESTING COMPANY* of Fairfield, New Jersey;

> Mr. ***Joek D. Rentz*** of *TRI-TECH CORPORATION* in Tampa, Florida;

> Analyst ***Shannon Smith*** then of the *EPA* facility in Tampa, Florida;

and others.

It is a duty for me to acknowledge also the invaluable assistance by the staff of various corporations, such as:

It is also a pleasure to thank the staff of numerous corporations, such as:

> *BRIGGS & STRATTON TEST CENTER* OF MILWAUKEE, WISCONSIN;

> *EPA* facility in Ann Arbor, Michigan;

> *MOTOR FUELER CORPORATION* of Largo, Florida;

> *COSA INSTRUMENTS,* of Norwood, New Jersey;

> *UNION CORPORATION* in Germany;

> *BADGER INSTRUMENTS,* Tulsa, Oklahoma;

> The *U. S. MILLER, LINCOLN AND THERMODYNAMICS CORPORATIONS;*

> *NASA* at Kennedy Space Center, Florida;

> *ATLANTIC ANALYTIC LABORATORY,* Whitehouse, New Jersey;

EP 0 905 512 A2

> *BIOMEDICS LABORATORIES* of Orlando, Florida;
> *SOUTHWEST MACHINE CORPORATION* of Nika, Missouri.
> *CAPOVANI BROTHERS CORPORATION* of Scotia, New York;
> *DIXIE ARC CORPORATION* of Birmingham, Alabama;
> *BUNTING MAGNETICS CORPORATION* of Newton, Kansas;
> *ELECTRON ENERGY CORPORATION* of Landsville, Pennsylvania;
> *ADAMS MAGNETIC PRODUCTS*, of Elizabethtown, Kentucky;
> *SHIN-ETSU RARE EARTH MAGNETS* of Tokyo, Japan;
> *CHEMYR P9OLYTECH LABORATORIES* of Maryland Height, Montana;
> *WELDING AUTOMATIC CORPORATION* of Anaheim, California;
> Various corporations producing high voltage pulse power units;
> Several other analytic laboratories, testing facilities and corporations.

I also want to express my appreciation and gratitude to numerous colleagues for invaluable consultations on various individual aspects of this research, including: Prof. ***Dieter Schuch*** of the *INSTITUTE OF PHYSICS* of *THE UNIVERSITY OF FRANKFURT*, Germany; Prof. ***Peter Gluck*** of the *INSTITUTE FOR ISOTOPIC AND MOLECULAR TECHNOLOGIES* of Cluj-Napoka, Romania; Dr. ***Eugene Mallove*** Founder and Editor in Chief of *INFINITE ENERGY*; Professor ***Tepper L Gill*** at the *INSTITUTE FOR ADVANCED STUDIES*, Princeton, New Jersey; Professors ***William F. Pound*** and ***J. V. Kadeisvili*** of the *INSTITUTE FOR BASIC RESEARCH*, Palm Harbor, Florida;and numerous other colleagues.

Needless to say, I am solely responsible for the content of this memoir.

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FAX MESSAGE

To: Dr. Ruggero M. Santilli & Kenneth H. Heffner
USMagneGas, Inc.

Fax: 727-507-8261 / IBR: 727-934-9275

From: Kent Knaebel

Date: June 15, 200?

Subject: Separation and Molecular Weight Measurements of MagneGas™ and MagneHydrogen™

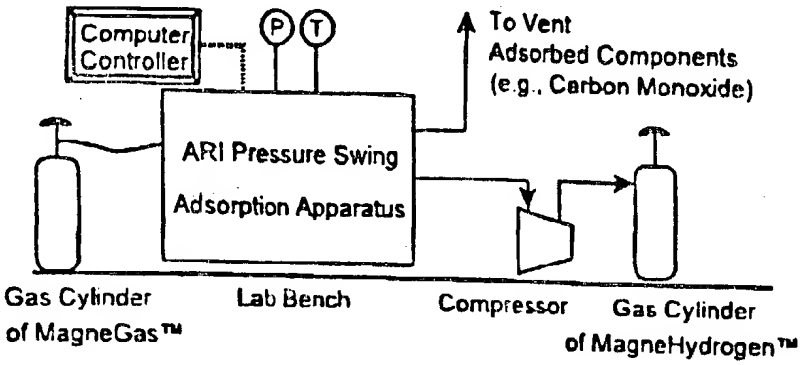
Dear Ruggero and Ken:

First, I will explain briefly our separation process, then I will explain how we measured molecular weights. To supplement the latter description, a data & calculation sheet is attached.

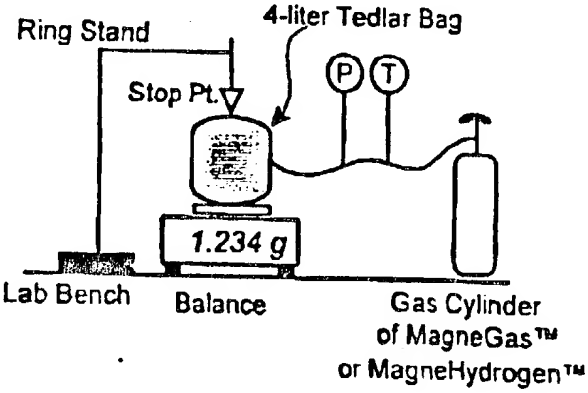
ARI conducted two separation trials using two different approaches to perform the separation. The first trial used a reduced copper catalyst bonded to an alumina substrate for removing carbon monoxide from the "MagneGas^TM" fuel sample. The premise was that the copper would exhibit attraction for the pi-bonds of the carbon monoxide. Unfortunately, this approach was not effective.

The second test employed 5A zeolite, a microporous molecular sieve. The premise was that a separation could be effected by molecular dimensions, exploiting the 'molecular sieving' effect. That is, it employs size exclusion, in addition to van der Waals forces. In subsequent off-line analyses, that test was shown to produce superior product, i.e., practically free of carbon monoxide. The third test employed 13X zeolite. The results of analyses from that test, however, are not known to ARI.

A semi-continuous, semi-automated separation was performed at ambient temperature employing a pressure swing adsorption (PSA) cycle using 5A zeolite to separate the gas components, removing the free carbon monoxide portion of the MagneGas^TM sample, yielding MagneHydrogen^TM. Both gases were subsequently tested to determine their average molecular weights. The schematic diagram below shows the general features of the apparatus.



Concerning the measurements of molecular weight you requested, we conducted the measurements in a calibrated volume, into which a measured mass of gas was admitted. By determining the mass per volume, and applying the ideal gas law, we were able to estimate the molecular weight. A sketch follows.



Generally, the measurements were accurate within 1% error, while the difference between the average values was about 3.5%. Therefore, we consider the difference to be real and not an artifact of measurement discrepancies. As mentioned earlier, a copy of the spreadsheet containing the data and calculations is attached.

Sincerely yours,

Kent S. Knaebel

MagneHydrogen™	(CO-Free)		
V (m^3) =	0.004970517	0.38	(pct. dev.)
P_{room} (psia)	14.09	97147.12613	Pa
T_{room} (°C)	26	299.15	K
MW_{air} (g/mol or amu/molecule)	29		
$M_{prod}=(m*R*T)/(V*P)+M_{air}$			
M_{prod} (g/mol or amu/molecule) =	15.05958998		

Trial	Mass Change (g)
1	-2.672
2	-2.735
3	-2.704
4	-2.715
5	-2.7065
std=	0.026337552
error%=	-0.973122202

MagneGas™	(Approx. 4.2% CO)		
V (m^3) =	0.004970517		
P_{room} (psia)	14.1	97216.0737	Pa
T_{room} (°C)	25.75	298.9	K
MW_{air} (g/mol or amu/molecule)	29		
$M_{feed}=(m*R*T)/(V*P)+M_{air}$			
M_{feed} (g/mol or amu/molecule)=	15.5953946		

Trial	Mass Change (g)
1	-2.578
2	-2.633
3	-2.616
4	-2.599
5	-2.6065
std=	0.023530123
error%=	-0.902747843

CALCULATIONS

Hydrogen

P_{room} (psia)	14.17	97698.70669	Pa
T_{room} (°C)	25.8	298.95	K
MW_{air} (g/mol or amu/molecule)	29		
MW_{H2} (g/mol or amu/molecule)	2.01594		
$V=(m*R*T)/(P*(M_{H2}-M_{air}))$			
V (m^3) =	0 004957161	4.957161307	L

Trial	Mass Change (g)
1	-5.283
2	-5.277
3	-5.26
4	-5.312
5	-5.158
m=	-5.258
std=	0.058961852
error%=	-1.121374136

Helium

P_{room} (psia)	14.24	98181.33968	Pa
T_{room} (°C)	26.2	299.35	K
MW_{air} (g/mol or amu/molecule)	29		
MW_{He} (g/mol or amu/molecule)	4.0026		
$V=(m*R*T)/(P*(M_{He}-M_{air}))$			
V (m^3) =	0.004983872	4.983872467	L

Trial	Mass Change (g)
1	-4.904
2	-4.948
3	-4.923
4	-4.884
5	-4.91475
std=	0.027293162
error%=	-0.555331635

DATA

RESULTS

In the following equations, f=Feed=MagneGas™, co=CO, i=arbitrary other component, p=Product=MagneHydrogen™:
The "feed" and "product" designations refer to the ARI Pressure Swing Adsorption Separation Apparatus, which performed the separation.

$$MW\text{-}f = X\text{-}co * MW\text{-}co + SUM (X\text{-}i * MW\text{-}i) = 15.60 \text{ (g/mol or amu/molecule)}$$

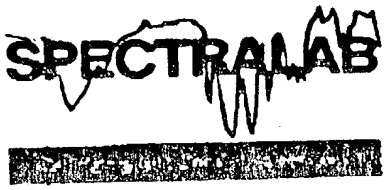
$$MW\text{-}p = SUM (X\text{-}i * MW\text{-}i) / (1 - X\text{-}co) = 15.06 \text{ (g/mol or amu/molecule)}$$

Using that equation yields a feed mole fraction of CO, X-co = 0.0417.

Again, this is just an estimate, and it relies on the assumption that the PSA unit quantitatively removed CO from the mixture.
In addition, the molecular weight measurement may be off by about 1%, too.
That potential error is not large enough to explain the difference of the numbers (considering multiple trials were run).

Table 1: Molecular Weight
(Determined with Constant Volume System Calibrated with Hydrogen and Helium)

Gas	Molecular Weight
	(g/mol or amu/molecule)
MagneGas™ [Feed]	15.60
MagneHydrogen™ [Product]	15.06
Ordinary Hydrogen [for comparis	2.016



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Pinellas Park, Florida 33781
Phone: (727) 545-2297 • Fax (727) 547-8024

SPL3464B
3/19/02

SPECTRALAB TEST REPORT FOR US MAGNEGAS

REQUESTED BY: Leon Toups, President, US MagneGas

SUBJECT: Analysis of MagneGas Processed to Remove Carbon Monoxide

SUBMITTED SAMPLES:
Samples A and B were submitted stored in low pressure cylinders at about 15 psig.

SUMMARY OF RESULTS:
The chemical composition of the submitted gas samples were determined by gas chromatography (GC) and Fourier-transform infra-red spectroscopy (FTIR). These analyses and those for prior gas samples are presented in the Tables of Results.

Based on a conventional chemical analysis utilizing gas chromatography, gas sample B was found to contain primarily hydrogen (55.2 %) and carbon monoxide (48.6 %) in similar amounts. Minor components included air (1.9 %), carbon dioxide (0.2 %), and a distribution of hydrocarbons composed primarily of methane (1.3 %), ethyne (0.03 %), ethene (0.05 %) and ethane (0.01 %). The amount of air was not included in the composition of the gas. The sample composition of sample B is similar to previous sample analyses reported in SPL3331 and SPL3346 except that acetylene was much lower in sample B than in previous samples. Sample A on the other hand, was found to contain virtually all hydrogen (99.2 %) with only small amounts of methane (0.8 %) and air (3.5 %) present. Again, the amount of air was not included in the composition of the gas. No carbon monoxide or carbon dioxide was detected. Nor were any higher hydrocarbons detected. FTIR analysis results confirmed the GC results for samples A and B.

SPL3464B

PROCEDURES/RESULTS:

Gas Chromatography (GC)

GC analysis was performed by injecting the sample within a 0.86 ml sample loop using an HP-5880A GC with a thermal conductivity detector (TCD). The separation of the components was obtained using a 15 ft long, 1/8 in od column packed with 80/100 mesh Porapak S and a 12 ft long, 1/8 in od column packed with 60/80 mesh molecular sieve 5A. The columns were placed in series, using switching valves, to separate hydrogen, oxygen, nitrogen, methane and carbon monoxide, while the remaining components, carbon dioxide, ethene, ethyne, ethane and higher molecular weight hydrocarbons, were analyzed with the Porapak S column connected directly to the TCD. Temperature programming was used to provide an efficient analytical method. Two separate analyses were performed. Known gas mixtures were used to calibrate the TCD. Representative chromatograms are presented in Figures 1 and 2. Results are presented in Table I.

The results of the analysis of sample B was similar to previous analyses of samples produced from anti-freeze mixtures of either ethylene glycol or propylene glycol and water. The removal of all components except hydrogen from sample B was largely successful. Only a small amount of methane and air remained after purification.

Fourier Transform Infrared Spectroscopy (FTIR):

The test was conducted per Spectralab test procedure STP 135. FTIR spectra were obtained using a Perkin Elmer model 1650 FTIR with Spectrum for Windows software. The submitted gas sample and calibration standards were each analyzed in a 10cm gas cell at atmospheric pressure. The background run for each standard was obtained on an evacuated cell. Component compositions were calculated from the absorbance values at 3310 cm^{-1} for ethyne (acetylene), 3014 cm^{-1} for methane, 2360 cm^{-1} for carbon dioxide, 2171 for carbon monoxide and 949 cm^{-1} for ethane (ethylene). The calibration standard for acetylene (1%), carbon dioxide (1%), methane (1%) and ethylene (1%) was obtained from Supelco (Scott Specialty Gas #0104216). The calibration standard for carbon monoxide (50%) and hydrogen (50%) was supplied by Matheson (lot #105-06-03669). Representative sample spectra are presented in Figures 3 and 4.

Results are presented in Table II with previous results of analyses conducted on SPL3331 and 3446.

APPROVALS:

MM

Michael J. Manka, Ph. D.

Jack Brand, Lab Director

SPL3464B

Table I
GC Analyses
Conventional Chemical Composition[1]

Component	Gas A	Gas B	Prior results SPL3331	Prior results SPL3446
Hydrogen	99.2	55.8	50.0	53.4
Carbon monoxide	None detected[2]	42.6	42.9	41.9
Carbon dioxide	None detected[2]	0.17	0.7	2.5
Methane	0.78	1.25	2.4	1.0
Ethane	None detected[2]	0.01	0.02	0.01
Ethene (ethylene)	None detected[2]	0.08	0.3	0.2
Ethyne (acetylene)	None detected[2]	0.03	3.9	0.9

[1] Results are normalized and exclude the amount of air present.
[2] The detection limit is <0.01 %.

Table II
FTIR Analyses
Conventional Chemical Composition

Component	Gas A	Gas B	Prior results SPL3331	Prior results SPL3446
Carbon monoxide	None detected*	45.5	44.6	42.8
Ethyne (acetylene)	None detected	0.05	4.5	1.2
Methane	0.8%	1.1	1.4	1.0
Carbon dioxide	0.01%	0.3	1.5	3.0
Ethene (ethylene)	None detected	0.08	0.6	0.3
Hydrogen (not measured)	Assumed balance	Assumed balance	Assumed balance	Assumed balance

* Detection limit ~ 0.1%.

HADRONIC JOURNAL 21, 789-894 (1998)

THEORETICAL PREDICTION AND EXPERIMENTAL VERIFICATIONS OF THE NEW CHEMICAL SPECIES OF *Magnecules*

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Received December 23, 1998

Abstract

As a result of comprehensive studies by various scholars initiated back in 1978, a generalization–covering of quantum mechanics under the name of *hadronic mechanics* has been built and has now reached operational maturity. Thanks to these results, D. D. Shillady and I have introduced in three preceding papers a generalization–covering of quantum chemistry under the name of *hadronic chemistry* and proved its effectiveness in achieving representations of molecular data accurate to several digits. In this paper I present, apparently for the first time, the most compelling experimental evidence to date supporting hadronic mechanics and chemistry, the theoretical prediction and several independent experimental verifications of a *new chemical species*, i.e., atoms and molecules bonded by a *new force*. The origin of the new species rest in the magnetic moment of electrons in their *orbits* around nuclei, which has been ignored throughout this century due to their spherical distribution. In this paper I show that the polarization in a plane of the orbit of the electron of the hydrogen atom implies the emergence of a magnetic moment which is 1,316 *bigger* than the magnetic moment of the nucleus (the proton). Such a large value is then sufficient to permit the theoretical prediction of corresponding strong magnetic bonds between atoms and molecules which are stable at ordinary conditions. Various consistency aspects imply the necessary use of hadronic mechanics and chemistry, e.g., to prevent that all molecules are ferromagnetic. In view of the magnetic origin of the new bond, I submit the names of *magnecules* for the new species, in order to distinguish it from the conventional "molecules" denoting valence bonds. I then present various experimental confirmations by independent laboratories on the existence and anomalous properties of magnecules in gases, liquids and solids. The memoir ends with an indication without detailed treatment that the new species implies the birth of new technologies currently under development by Toups Technology Licensing Corporation, of Largo Florida, Givaudan–Roure Corporation of Teaneck, New Jersey, and other U.S. Corporations.

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THEORETICAL PREDICTION AND EXPERIMENTAL VERIFICATIONS OF THE NEW CHEMICAL SPECIES OF *Magnecules*

Ruggero Maria Santilli

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1. INTRODUCTION

It is known by experts in the field although rarely indicated in Ph. D. courses or in the technical literature, that, despite outstanding achievements of clear historical proportions achieved throughout this century, *quantum chemistry* [1] is still afflicted by numerous fundamental unsolved problems, insufficiencies or shear inconsistencies such as:

1) The lack of a sufficiently strong molecular bonding force, because the forces currently assumed (the exchange, van der Waals and other forces) were conceived for nuclear structures in which they are known to be weak, thus demanding the additional introduction of the strong nuclear forces.

2) The impossibility to explain why the hydrogen, water and other molecules have only two hydrogen atoms, because the currently used bonding forces of nuclear type were conceived for an arbitrary number of constituents.

3) The impossibility to achieve an exact representation from unadulterated quantum principles of molecular binding energies because missing of about 2% of the experimental values, e.g., in the selfconsistent treatments.

4) More accurate representations of molecular characteristics have been recently achieved via structural modification of the coulomb law with gaussian and other factors called "screenings". However, on rigorous scientific grounds, these manipulations prohibit the very use of the term "quantum" mechanics and chemistry because gaussian screenings of coulomb force imply the loss of the hydrogen atom, the lack of stability of all electron orbits, and the absence of the very notion of "quantum" of energy which is known to requires stable orbits for its emission or absorption, as very well known. A fully similar occurrence holds for variational methods which, besides admitting unlimited number of free parameters of totally unknown origin and motivation (thus being of purely *mathematical* value), can be proved to violate the very conditions to preserve a " quantum".

5) The impossibility to conduct meaningful thermochemical representations because the 2% currently missing in the binding energy implies an error which is 50 times bigger than the average energy of a thermochemical reaction.

6) Excessive computer times in calculations despite the use of the most modern possible computers.

7) Dramatic disagreement between the correlations used in current orbital theories (which refer to an arbitrary number of electrons), and the experimental evidence that correlations only occur between *pairs* of electrons.

8) The impossibility to represent exactly electric and magnetic moments of molecules which at times are wrong even in the sign, let alone the value.

9) The prediction by quantum chemistry that all molecules are

ferromagnetic (Fig. 1.1), which is in dramatic disagreement with experimental evidence.

It is evident that the lack of solution of the above fundamental problems *is not* due to quantum chemistry per se, but rather to the main underlying theory, *quantum mechanics*. In fact, it is today known that most deficiencies are due to the complete absence of a scientific-quantitative representation by quantum mechanics of the conditions of deep overlappings of the extended wavepackets of electrons.

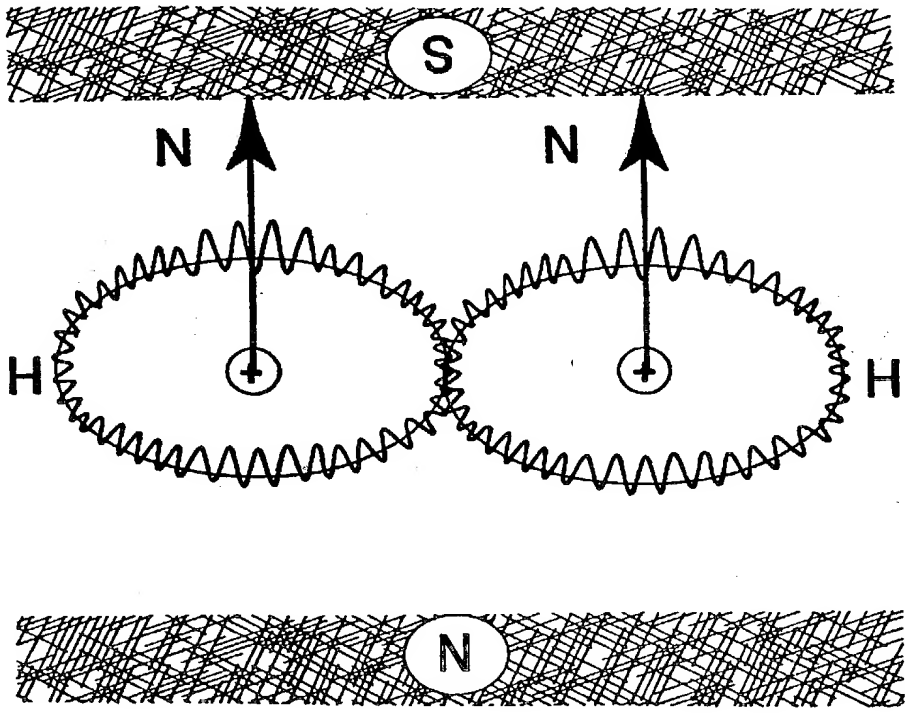


FIGURE 1.1 A schematic view of the prediction by quantum chemistry that all molecules are ferromagnetic, here expressed for the case of the simplest possible hydrogen molecule H_2 = H-H at absolute zero degree temperature and in the absence of any motions. The prediction is an un-avoidable consequence of the current conception of molecular structures in which the bond is due to exchange and other forces of nuclear type, as a

consequence of which each atom preserves its individuality. The most rigorous discipline of this century, quantum electrodynamics, then establishes that, under an external magnetic field South–North the orbits of all valence electrons must acquire the opposite polarization North–South, resulting in a total net magnetic polarity $H_{\uparrow}$–$H_{\uparrow}$ which is in dramatic disagreement with experimental evidence. The only way known to this author to resolve the inconsistency is by assuming a much stronger correlation among the two electrons which, however, is outside quantum mechanics and chemistry, but fully permitted by their hadronic coverings [2,3].

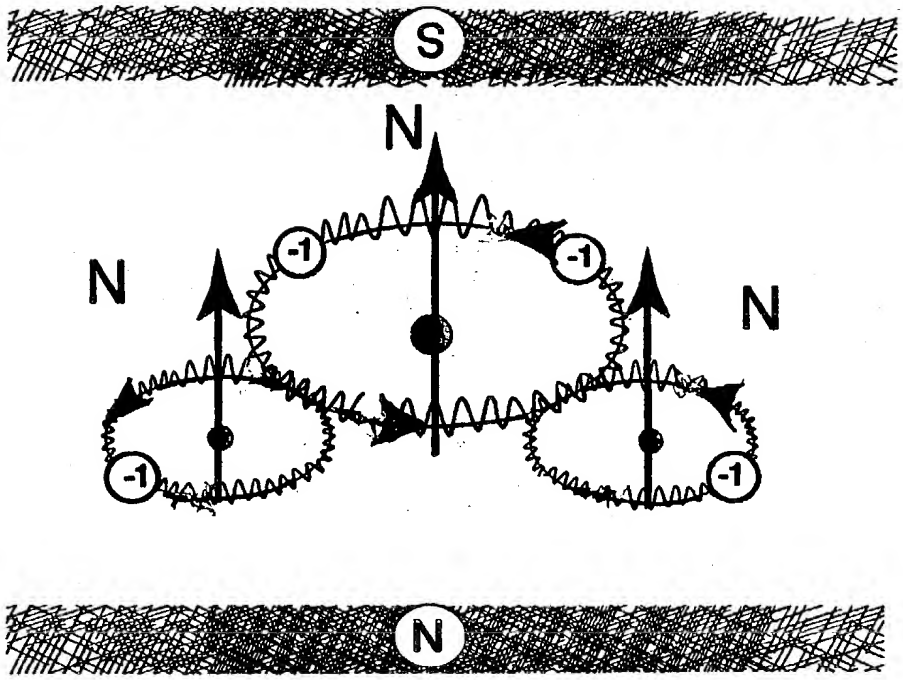


FIGURE 1.2: A schematic view of the behavior of the valence electrons of the conventional model of the water molecule H_2O = H–O–H at 0 K under an external magnetic field South–North. As it is the case for the hydrogen molecule, quantum electrodynamics predicts that, under the currently assumed independence of the atoms and weak correlations, each atom

must assume a polarization North–South opposite to that of the external field, resulting in the total net magnetic polarity of the water molecule $H_{\uparrow}-O_{\uparrow\uparrow}-H_{\uparrow}$ which is also in dramatic disagreement with experimental evidence, since water is diamagnetic as well known. After studying this inconsistency for years, the only resolution I know is the conception of a new model of the water molecule as achieved by hadronic mechanics and chemistry [2,3].

Quantum mechanics is *linear, local–differential and potential–hamiltonian–unitary,* while ***the conditions of deep overlapping of the wavepackets is known to be nonlinear, nonlocal-integral and nonpotential, thus nonhamiltonian and, therefore, nonunitary.*** Note that the *nonlocality* is caused by the overlapping of the "extended wavepackets" of the electrons while the charge remains perfectly "point–like".

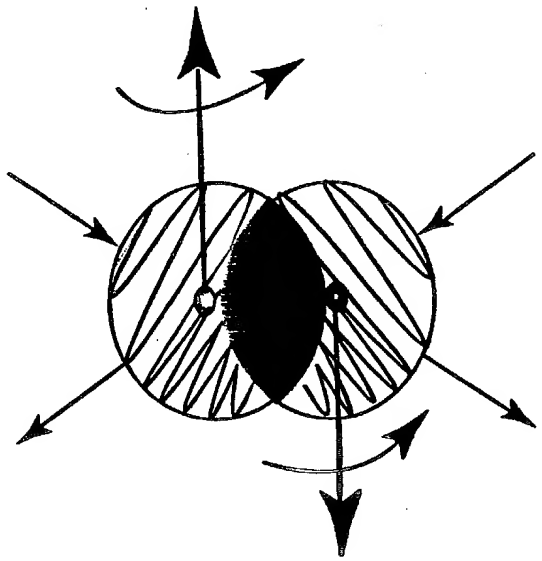


FIGURE 1.3: A schematic view of the physical conditions at the foundation of the new chemical species introduced in this paper, the deep overlapping of the extended wavepackets of the valence electrons under their point–like charge structure. These conditions are known to be nonlinear, nonlocal and nonpotential, thus nonhamiltonian–nonunitary and, therefore, outside any realistic hope of scientific treatment via quantum

mechanics and chemistry. It was shown in papers [3] that the ignorance of the conditions of this figure in support of the quantum mechanical point–like, as well as linear, local; and potential abstraction of overlapping wavepackets of the electrons has implied the inability to reach a deeper and more accurate understanding of molecular structures.

In view of the above and other insufficiencies of quantum mechanics in all branches of science (see Ref. [2e] for a comprehensive presentation), a generalization–covering of the theory under the name of ***hadronic mechanics*** was proposed by **R. M. Santilli** [2a] when at Harvard University back in 1978 and then studied by numerous mathematicians, theoreticians and experimentalists (for a comprehensive presentation up to 1995 see monographs [2c] with an update to 1997 in memoir [2d]).

Operational maturity on the formulation and applications of quantum mechanics was reached only recently in memoir [2d] thanks to the use of the new ***iso-, geno- and hyper-mathematics*** which permitted the first known invariant formulation of nonlinear, nonlocal and nonunitary effects. Hadronic mechanics has therefore three branches called ***iso–, geno- and hyper-mechanics*** which are used for the representation of isolated–conservative–reversibles, open–nonconservative–irreversible and, irreversible–multi–valued structures, respectively. Numerous applications and experimental verifications of hadronic mechanics now exist in various fields (see the outline in Sect. 3.15 of Ref. [2d]).

Thanks to the achievement of maturity of hadronic mechanics, **R. M. Santilli** and **D. D. Shillady** [3] have recently constructed a generalization–covering of quantum chemistry under the name of ***hadronic chemistry*** which is also based on the novel ***iso-, geno- and hyper-mathematics.*** Hadronic chemistry then comprises three corresponding branches called ***iso–, geno- and hyper-chemistry,*** which are used for a more accurate representation of molecular structures, irreversible chemical reactions and biological systems, respectively.

In particular, Paper I [3a] propose the main formalism of the novel hadronic chemistry. The subsequent Papers II [3b] and III [3c] propose a novel ***isochemical model of molecular bonds*** whose main feature is the assumption that ***pairs of valence electrons from two different atoms couple themselves in a singlet quasi-particle state at short distances (of 1 fm or less) we have called isoelectronium,*** with the following main features (see Sect. 5 of Paper II [3c])

Main characteristics of the isoelectronium:

Charge: 0; spin 0; magnetic moment 0; rest energy 1.02 MeV; (1.1)

Radius $r_c = b^{-1} = 6.8432329 \times 10^{-11}$ cm = 0.015424288 bohrs .

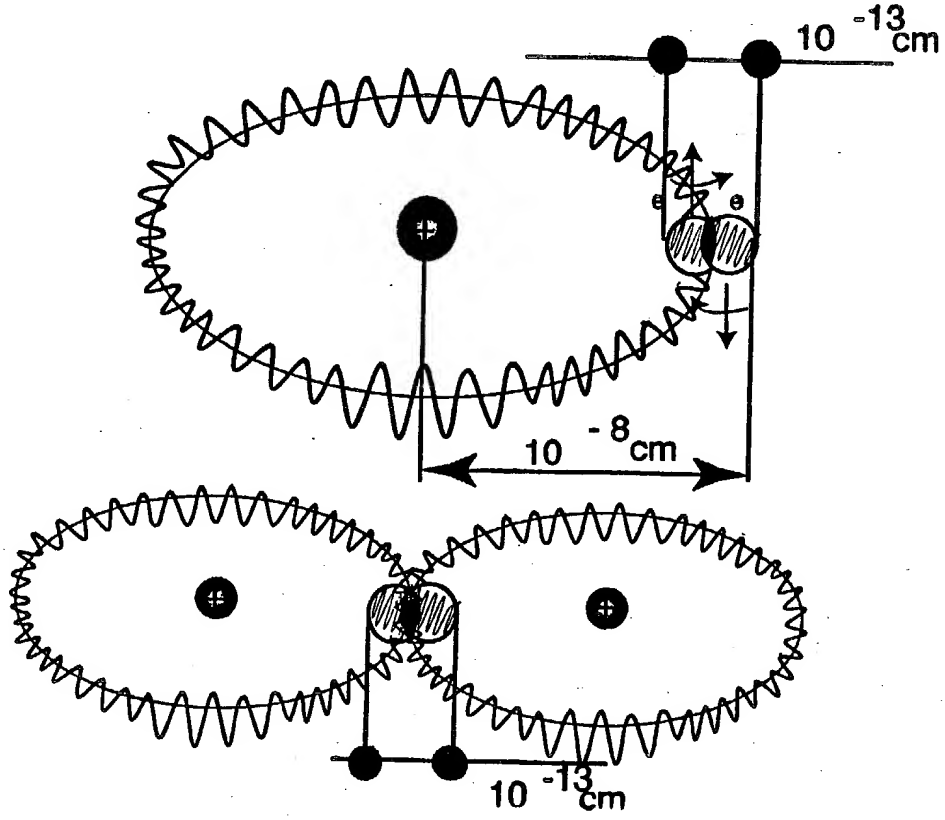


FIGURE 1.4: A schematic view of the reason why quantum mechanics is *exactly valid* for the structure of *one* hydrogen atom, but only *approximately valid* for the two atoms of the hydrogen molecule. In the former case we have very large mutual distances between the electron and the nucleus which permits an effective approximation of the electron's *wavepacket* as being *point-like*. In turn, this implies the exact applicability of the linear, local and potential axioms of quantum mechanics. In the case of the hydrogen molecule these conditions are no longer valid because we now have the *deep overlapping of the wavepackets of the valence electrons at distances of 1 fm or less*. Under these conditions, a point-like approximation of the *wavepacket* of the electrons is no longer valid. It then follows that quantum mechanics and chemistry *cannot* be exactly valid for molecular structures. Hadronic mechanics and chemistry have been constructed precisely for the quantitative invariant description of the nonlinear, nonlocal and nonpotential conditions of deep waver-overlappings of valence electrons or of other particles.

The above new conception of molecular bonds has the following primary implications:

1) It introduces for the first time a *new* strong, *attractive forces among the two identical electrons* at distances of 1 fm or less suitable to represent the strength of molecular bonds in the physical reality, which is essentially the equivalent in chemistry of the strong force in nuclear physics.

2) It explains for the first time why the hydrogen, water and other molecules have only two hydrogen atoms. In fact, once two valence electrons are bonded into the singlet isoelectronium, they evidently reject the bonding of any additional electron.

3) Isochemistry has permitted the first representation of binding energies which is accurate to the *seventh digit.*

4) The above accurate representation occurs under the *exact validity of the basic axioms of isochemistry without ad hoc adulterations.*

5) Since the representation of binding energies is accurate to the seventh digit, isochemistry permits accurate thermochemical calculations.

6) Isochemistry implies convergence of power series much faster than those of quantum chemistry with a reduction of computer usage at least 1,000 times.

7) Isochemistry only allows correlations among *pairs* of electrons at all levels of study.

8) Isochemistry has provided a representation of electric and magnetic moments which is also accurate to *several digits,* let alone having the correct sign.

9) Isochemistry resolved the inconsistent prediction by quantum chemistry that all molecules are ferromagnetic (Figs. 1.8 and 1.9).

It should be indicated that Papers II and III provided a quantitative study of both possibilities that the isoelectronium is *stable* or *unstable,* by leaving the resolution of these alternative to subsequent studies upon the availability of additional theoretical and experimental evidence.

In particular, the *full stability* of the isoelectronium was reached under the *exact validity* of the axioms of isochemistry which yields an attractive hulten potential as representing the strong bond of the two valence electrons in the isoelectronium. By comparison, the case of *partial stability* of the isoelectronium was reached under an *approximation* of these basic principles which yields an attractive, yet weaker force responsible for the isoelectronium (rather than the much stronger hulten force).

The new evidence presented in this paper appears to favor the case of a

mostly stable isoelectronium, because necessary to resolve the inconsistency of Figs. 1.1 and 1.2.

In fact, if the bonding of valence electrons is only *partially stable*, this necessarily implies that all molecules should have a well defined magnetic polarizability whose value is dependent on the time percentage of said instability.

For instance, suppose that the isoelectronium represents only the tendency of the valence electrons to couple-correlate themselves as in Sect. 8 of Paper II [3c] (see also Fig. 1.5), and suppose that their bonding only occurs for 10% of the time, thus having unpaired valence electrons for 90% of the time as in conventional quantum chemistry.

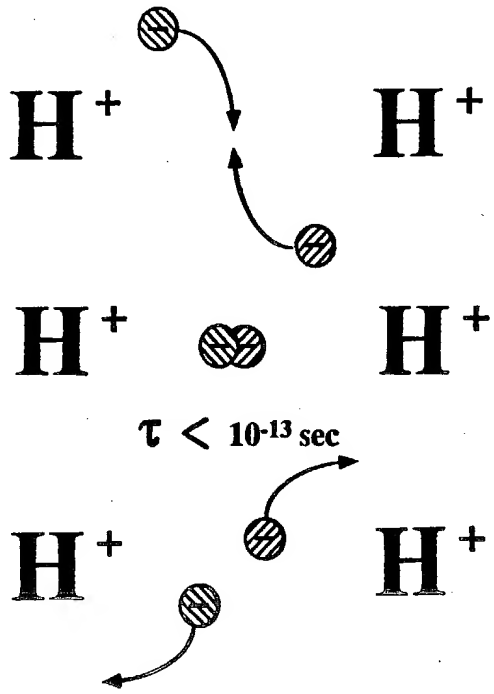


FIGURE 1.5: A schematic view of the ***mostly unstable isoelectronium*** of Papers II and III [3], essentially representing the tendency of electron pairs to have deep correlations at short distances in singlet coupling (evidently from Pauli's exclusion principle), although for a small period of time. This short lifetime originates from an *approximation* of the hulten potential well of the isoelectronium via one single gaussian. It is evident that the

lifetime of the isoelectronium increases with the improvement of the approximation via several gaussians, all the way to the full stability of the next figure.

It is then evident that, under the latter assumptions, *all molecules must acquire a net magnetic polarity under an external magnetic field, thus being ferromagnetic,* although with smaller numerical values as compared to the conventional model of molecular bonds.

The only way known to this author to resolve such a dramatic disagreement between the theory and the experimental data on the behavior of molecules under external magnetic fields, is the assumption of a mostly stable isoelectronium.

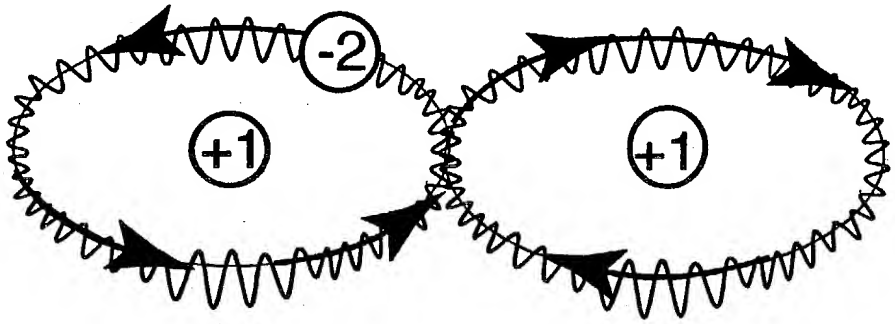


FIGURE 1.6. A schematic view of the ***mostly stable isoelectronium*** at absolute zero degree temperature and in the absence of rotations or other collective motions, here depicting the ***isochemical model of the hydrogen molecule.*** Note that ***when rotations at ordinary temperature are admitted, the model recovers the conventional space distribution of the hydrogen molecule.*** The model also holds for generic dimers HO, HC, etc. The model is here depicted in terms ***orbits*** of the valence electrons (rather than of *density distributions*). The main assumption is that the two valence electrons, one per each atom, correlate themselves into a bonded singlet state at distances of 1 fm or less, called ***isoelectronium,*** which describes a oo–shaped orbit around the respective two nuclei much similar to the orbit of a planet in certain binary star systems. The isoelectronium is then responsible for the ***attractive force***

between the two atoms. The ***binding energy*** is instead characterized by the oo-shaped orbit of the isoelectronium around the two nuclei conceptually represented in this figure via a standing wave for a particle of spin 0 and charge -2e. Note that, at ordinary temperature, rotations would reproduce the conventional spherical distribution.

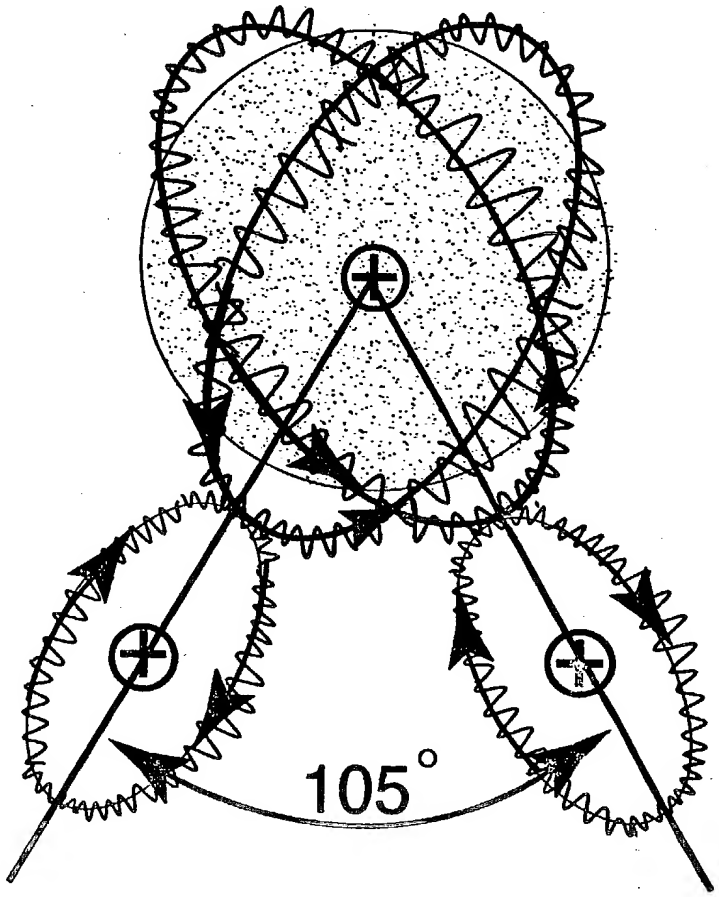


FIGURE 1.7: A schematic view of the ***isochemical model of the water molecule*** first proposed in Paper II [3c] with two isoelectronia (one per each HO dimer), presented at absolute zero degree temperature and in the absence of any rotational or other motions. ***Note again that when rotations at ordinary temperature are admitted, the model recovers the conventional "Mickey Mouse" shape of the water molecule*** [1]. The model is also depicted in terms of ***orbits*** of the valence electrons,

without precluding the description in terms of *density distributions* familiar in the existing literature. As one can see, a visual inspection of the new model resolves some of the fundamental open problems of the current conception of the water molecule, such as the lack of a sufficiently strong bonding force or the inability to explain why the water molecule has only *two* hydrogen atoms and only *one* oxygen.

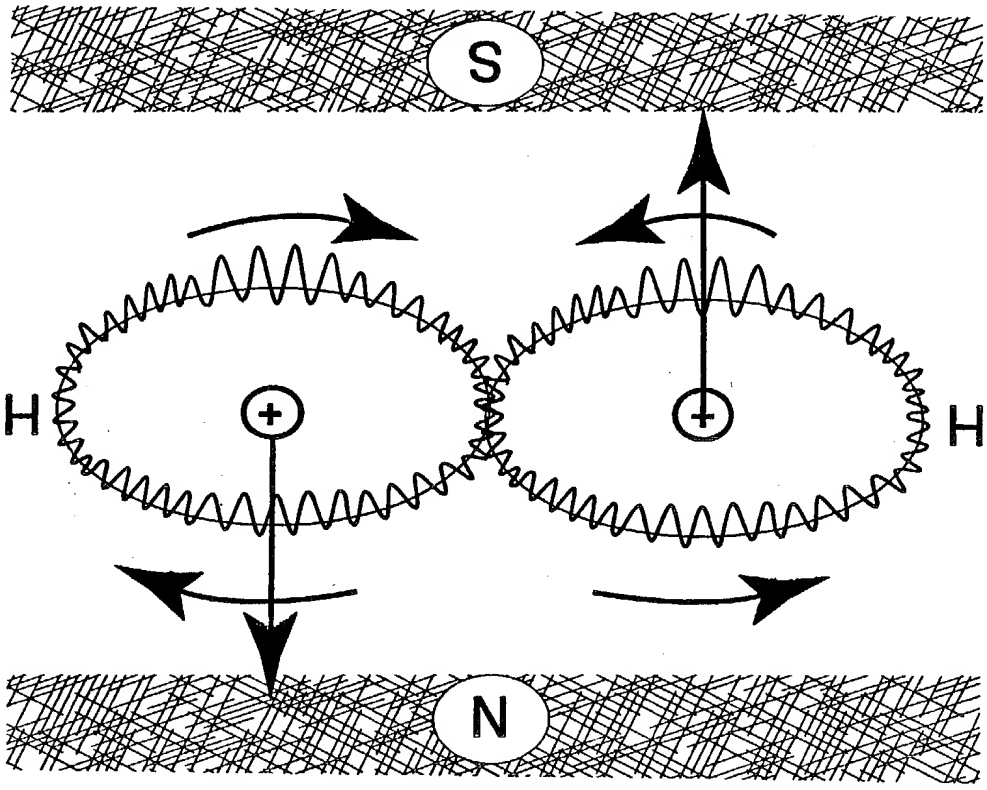


FIGURE 1.8: A schematic view of the resolution of the inconsistency of Fig. 1.1 permitted by the novel isochemical model of molecular bonds, here illustrated for the case of the simplest possible hydrogen molecule at 0 K and in the absence of any motion. In the conventional quantum model the valence electrons preserve their individuality, thus implying the mandatory prediction of a total net magnetic polarity under an external

magnetic field. For isochemistry the two valence electrons are no longer independent, but are bonded into the isoelectronium which describes an oo-shaped orbits around the two nuclei *with opposite rotational motion in the two o-branches.* The impossibility of a total net magnetic polarity is then evident and so is the resolution of the inconsistency of Fig. 1.1. Note the *necessity* for the stability of the isoelectronium for the resolution of said inconsistency.

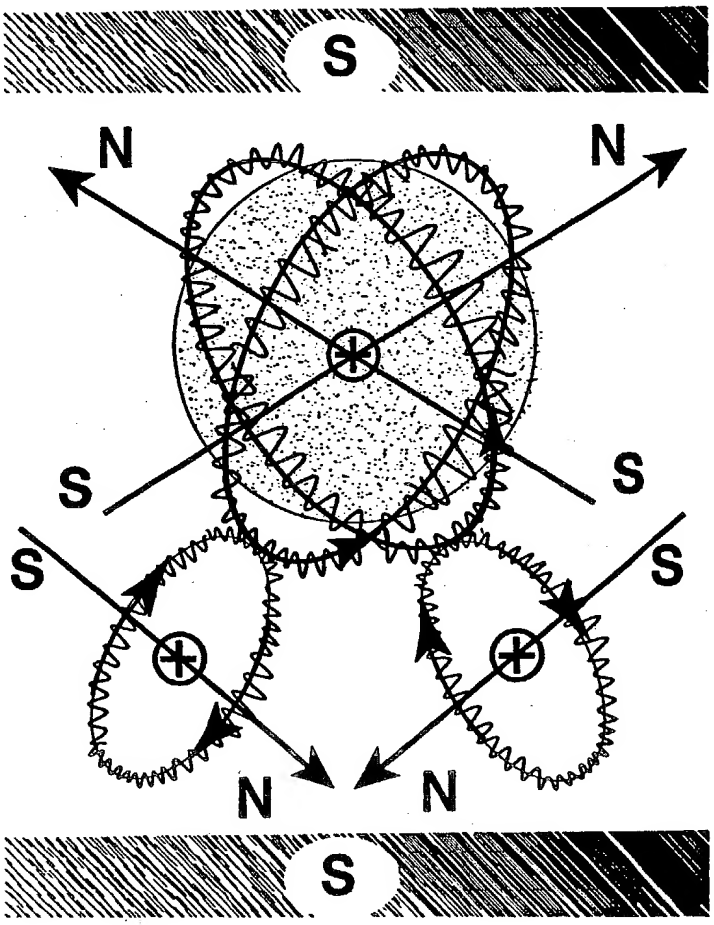


FIGURE 1.9: A schematic view, again at absolute zero degree temperature and in the absence of motions, of the resolution of the inconsistency of quantum chemistry of Fig. 1.2, namely, the impossibility for the isochemical model of the water molecule to acquire a

net magnetic polarity under an external magnetic field. Note that the resolution presented in this figure is that for the worse possible configuration of the isochemical model, that with the *same* external polarity South–South. The resolutions of this figure and that of the preceding figure are at the foundation of the new chemical species introduced in this paper.

Due to the importance of the topic, interested scholars are encouraged to present alternative models with a proof of the impossibility for molecules to acquire a net magnetic polarity under a mostly unstable isoelectronium and/or correlations of valence electrons.

I should stress that the isoelectronium *cannot* be 100% stable and *small instabilities* must be assumed. This is due to the fact that isochemistry coincides with quantum chemistry at distances sufficiently bigger than 1 fm [3]. In particular, isochemistry preserves exchange, van der Waals and other forces of current use. In turn, the latter forces necessarily imply a small instability of the isoelectronium. The same small instability can be reached under relativistic and field theoretical treatments.

Throughout this analysis I shall therefore assume that ***in the first nonrelativistic approximation of this paper, the isoelectronium is a stable singlet state with characteristics (1.1),*** while small instabilities should be treated in future relativistic or field theoretical studies.

In this paper I cannot possibly review hadronic mechanics and chemistry to avoid an un–necessary and prohibitive length. However, the reader should be aware that a technical understanding of this paper requires a technical knowledge of hadronic mechanics at least as presented in memoir [2d], and of quantum chemistry at least as presented in Papers I, II and III [3].

Finally, in reading this paper chemists should keep in mind that I am a theoretical physicist. Therefore, the used terminology is that of physics rather than chemistry, although I have made an effort in trying to identify both terminologies for the main aspects of the analysis to render the paper accessible to both physicists and chemists.

It should be however kept in mind that the *foundations* of the new species are *purely physical,* thus rendering appropriate the use of the physics terminology. Chemistry and related terminology are expected to be appropriate in the study of the *chemical behavior* of the new species.

2. THEORETICAL PREDICTION OF MAGNECULES

2.1. Definition of magnecules. In this paper I present, apparently for the first time, the theoretical prediction permitted by hadronic mechanics [2] and chemistry [3] of the first new chemical species since the discovery of the valence bonds in the past century, where by "new species" I mean "conventional atoms and molecules bonded by a new force".

The main hypothesis is that atoms and molecules can be subjected to a new ***polarization*** of the orbits of (at least the) valence electrons, where "polarization" is intended in physics as ***the acquisition of a symmetry axis (or plane) with a fixed orientation in space*** (apparently called in chemistry the "cyclotron resonating orbit"), and the polarization is such to produce a magnetic field sufficiently strong to permit a magnetic bond stable at ordinary conditions of temperature and pressure.

The new species is submitted under the main name of ***magnecules*** and other terms based on the prefix "magne" indicating *magnetic bonds*, while the name "molecules" will be used in its conventional meaning of denoting *valence bonds*.

DEFINITION 2.1: "Magnecules" constitute a new chemical species composed by conventional neutral atoms and molecules in liquids, gases or solids under new magnetic bonds due to the polarization of the orbits of (at least the) valence electrons which is stable at ordinary conditions and possesses the following characteristics:

I) The new species should not exist under sole valence bonds, e.g., because having a molecular weight much bigger than that of the heaviest molecule of substance considered;

II) The new species is identified in mass spectrometry by new peaks not present in the same substance without magnetic polarization;

III) The new peaks result to be "unknown" in the computer search among all known conventional molecular structures;

IV) The new peaks have no infrared (for gases) or ultraviolet (for liquids) signature at all;

V) The sole infrared or ultraviolet signatures of the new peaks are those of the conventional atoms or molecules constituting the new species;

Vi) The ultraviolet or infrared signatures of conventional atoms or molecules in the new species are generally anomalous, thus indicating a deformation of their electron orbitals called "mutation";

VII) The new species has anomalous penetrations thru other substances and anomalous adhesion to other substances, generally resulting in backgrounds following mass spectroscopic measurements with major differences with the original backgrounds prior to said measurements;

VIII) Physical characteristics of the new species (specific weight, viscosity, etc.) and chemical features (thermochemical energy released or absorbed, chemical reactions, etc.) are generally different than those of the same substance without magnecules; and

IX) All the above anomalies disappear at a sufficiently high temperature (the Curie point of the new species) evidently varying from substance to substance.

Magnecules shall be called: ***elementary*** *when composed by only two molecules;* ***magneplexes*** *when entirely composed by several identical molecule; and* ***magneclusters*** *when composed by several different molecules.*

By denoting the conventional valence bond with the symbol " – " and the new magnetic bond with "× ", examples of *elementary magnecules* in gases and liquids are respectively given by

$$\{ H - H \} \times \{ H - H \}, \{ O - O \} \times \{ O - C - O \}, \text{ etc.,} \tag{2.1a}$$

$$\{ C_{15} - H_{20} - O \times \{ C_{15} - H_{20} - O \}, \quad \text{etc.;} \tag{2.1b}$$

examples of *magneplexes* in gases and liquids are respectively given by

$$\{ H - H \} \times \{ H - H \} \times \{ H - H \} \times \ldots \text{, etc.,} \tag{2.2a}$$

$$\{ H - O - H \} \times \{ H - O - H \} \times \ldots, \text{ etc.,} \tag{2.2b}$$

and examples of *magneclusters* are given by

$$\{ H - H \} \times \{ C - O \} \times \{ O \} \times \{ O - C - O \} \times \{ C \} \times \ldots \text{, etc.,} \tag{2.3a}$$

$$\{ C_{13} - H_{18} - O \} \times \{ C_{14} - H_{12} - O_3 \} \times \{ C_{15} - H_{20} - O \} \times \ldots \text{, etc.,} \tag{2.3b}$$

In this paper I, shall present the theoretical prediction of magnecules and a number of independent experimental verifications for their existence at the gaseous, liquid and solid states. A number of additional independent experimental

tests on magnecules are under way and they will be presented in future works.

2.2. The magnetic origin of the new bonds. It is evident that, as a necessary condition for their existence, *any clusters of atoms and molecules requires a bonding force for their existence.*

It is equally evident that the *sole* possible forces for new bonds are either of *electric* or of *magnetic* type. In fact, all available valence electrons are used in molecules by the very conception of the new species and, therefore, they cannot contribute to any new bond (which would be conventional anyhow). The weak and strong nuclear forces should be also dismissed because they are notoriously short range. This leaves the electric and magnetic structures of atoms and molecules as the only possible origin of the new bond.

It is equally evident that the electric origin of the new bond should be dismissed for any sufficiently strong and stable new species. To begin, *the atoms and molecules constituting the new species are assumed to be neutral* (Definition 2.1). As a consequence, the sole remaining possibility via electric fields is the *electric polarization of atoms and molecules,* e.g., that resulting from deformations of the electron orbits and/or displacements of the nuclei due to external fields.

It is equally evident that such a polarization is not sufficiently stable to characterize a stable new species. In any case, simple calculations (here left to the interested reader) establish that the numerical value of electric polarizations of atoms and molecules is too small to permit any appreciable new bond.

The above occurrence establish beyond scientific doubt that the only possibility for the new species to exist is that the new bonds are of *magnetic* type.

By continuing to proceed via exclusions, the only possible magnetic moments in a conventional atom or molecule are:

1) The intrinsic magnetic moments of the valence and other electrons;

2) The intrinsic magnetic moments of the nuclei; and

3) The magnetic moments caused by the rotation of the valence (and other) electrons in their orbits.

It is easy to see that *the intrinsic magnetic moments of the electrons have no possible contribution to the new species.* In fact, according to quantum chemistry, electrons have a density distributions in all three dimensions, thus preventing a localized value of their intrinsic magnetic moments.

Moreover, according to isochemistry, valence electrons couple themselves

into the singlet isoelectronia which have identically null magnetic moments by conception, Eq. (1.1).

It is equally evident that *the intrinsic magnetic moments of nuclei cannot possibly contribute to the creation of a new species for various reasons,* such as their insufficient strength as well as their excessive distance from other atoms (on an atomic scale).

At any rate, it is known that nuclei can be readily polarized with external magnetic fields, as established in the contemporary MRI technology [4]. In the event nuclear magnetic moments would be responsible of the new species, the mere application of a magnetic field to any liquid would imply its complete reduction to one single magneclusters in dramatic disagreement with experimental evidence.

In conclusion, ***the sole possibility for the existence of the new species is that their bonds originate from the magnetic moments of the orbits of valence electrons.***

Various studies of clusters of atoms and molecules without detailed theoretical identifications and experimental verifications of the *force* responsible for their structure are rather customary in contemporary quantum chemistry, e.g., in the study of the so-called "fullerenes" [5]. This implies the possibility that the new species has already been encountered a number of times in this century, although not identified as such.

2.3. The magnetic polarization of the orbits of valence electrons

To my knowledge, the chemical literature of this century on magnetic fields has been restricted to the intrinsic magnetic moments of nuclei and electrons [4].

Despite a rather laborious search, I have been unable to identify any study on the magnetic moments of the *orbits* of electrons in the rather vast literature of both quantum mechanics and chemistry (the indication of pre-existing studies would be gratefully appreciated for proper quotation in future works).

The magnetic moments due to orbits of valence electrons have been generally forgotten throughout this century for good reasons. In their natural state at ordinary conditions of pressure and temperature, valence electrons of all atoms have a *spherical* distributions (Fig. 2.1A) in which case no magnetic moment associated to the orbits can possibly be detected.

However, quantum electrodynamics, establishes that the rotation of any electron in a *plane* orbit does indeed create a magnetic moment according to well known laws (see next subsection).

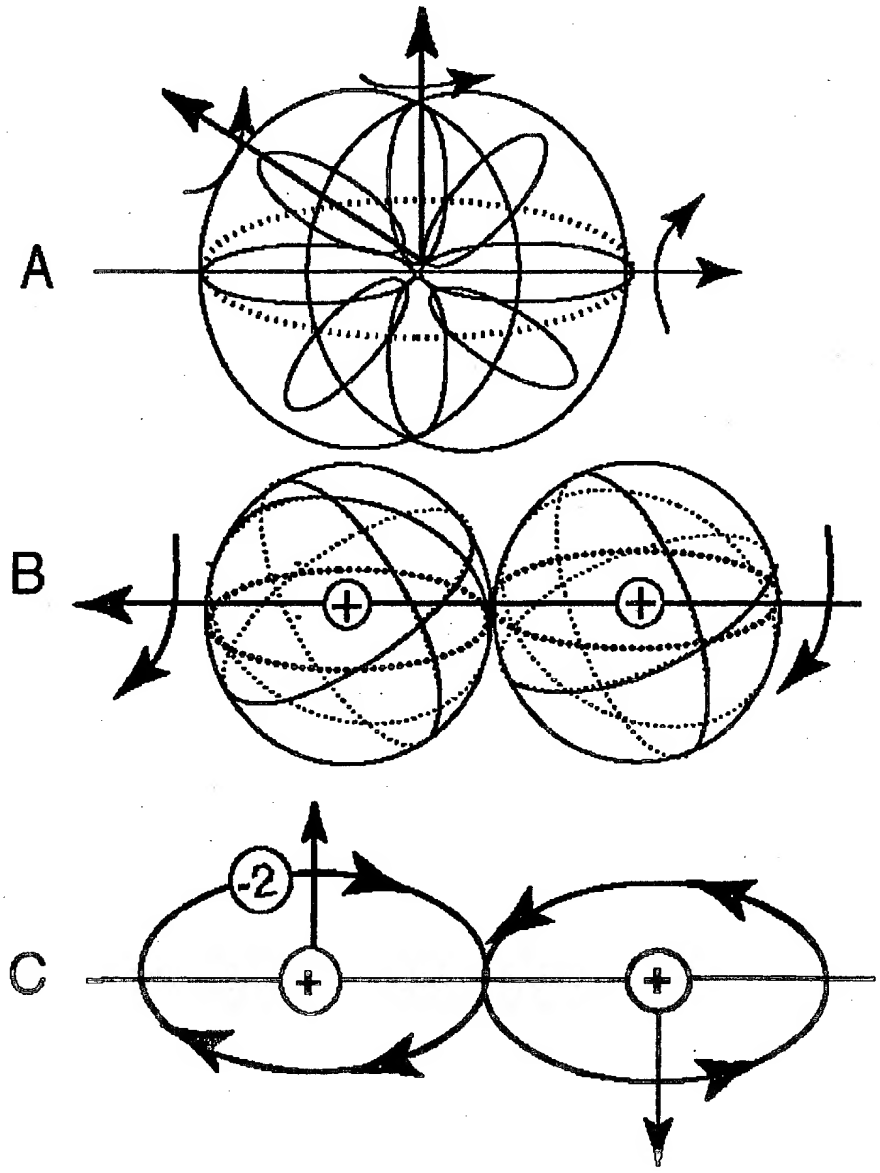


FIGURE 2.1: A schematic view of the mechanism at the foundation of the new species, the polarization of the orbits of valence electrons in a plane (cyclotron resonance orbits) here

illustrated for the case of the hydrogen molecule. As it is well known, in its natural gas state at ordinary conditions of pressure and temperature, *the hydrogen molecule is a sphere whose radius is equal to the diameter of a hydrogen atom* (Case A). A main assumption of this paper is the existence of a technology based on external magnetic fields which eliminates the rotational motions, by reaching first the configuration of Case B and then that of Case C in which the orbit of the isoelectronium is polarized in a plane. The emergence of two well defined magnetic moments is then evident. Note that I assume no new feature of the atomic structure, and merely use the manifestation of an intrinsic feature of the atomic structure.

The fundamental hypothesis I submit in this paper is therefore that ***the orbit of the valence electrons can be polarized under sufficiently strong external magnetic fields, thus manifesting in this way their magnetic moment.*** The existence of the magnecules is a mere consequence.

As we shall see in the next subsection, the value of the magnetic moment of the polarized orbits of valence electrons is much bigger than the corresponding nuclear values. However, even ignoring such numerical value, a mere observation of the elementary magnecule (2.1) indicates the close proximity of the polarized orbits of different atoms. A stable magnecule is therefore expected even for smaller values of said magnetic moment due to the strength of magnetic attraction at small distances.

I should stress that ***the polarization of the orbit of the isoelectronium in a plane is studied in this paper only at absolute zero degree temperature and in the absence of rotations or other collective motions. It is evident that at ordinary temperature the application of external magnetic fields cannot produce polarization of the orbits in a plane, but only the deformation of the spherical distribution B of Fig. 2.1 into prolate spheroidal ellipsoids.***

2.4. Theoretical representation of magnecules. By denoting with the arrow ↑ the magnetic polarity North–South and with the arrow ↓ the (vertical) polarity South–North, and by keeping the study at the absolute zero degree temperature, the main assumption of this paper is that the hydrogen molecule H–H can be polarized into such a form that the orbit of the isoelectronium is in a plane with resulting structure $H_{\uparrow}-H_{\downarrow}$ (Fig 1.6).

Under this assumption, elementary magnecule (2.1) has the structure (see Fig. 2.2)

$$\{ H_{\uparrow}^{a} - H_{\downarrow}^{b} \} \times \{ H_{\uparrow}^{c} - H_{\downarrow}^{d} \}, \qquad (2.4)$$

where: a, b, c, d, are symbols merely denoting different atoms; the polarized hydrogen atom $H_{\uparrow}^{a}$ is bonded magnetically to the polarized atom $H_{\uparrow}^{b}$ with the South magnetic pole of atom a is bonded to the North pole of atom b; and the North polarity of atom c is bonded to the south polarity of atom d. This results in a strong bond due to the flat nature of the atoms, the corresponding mutual distance being very small and the magnetic force being consequently being large.

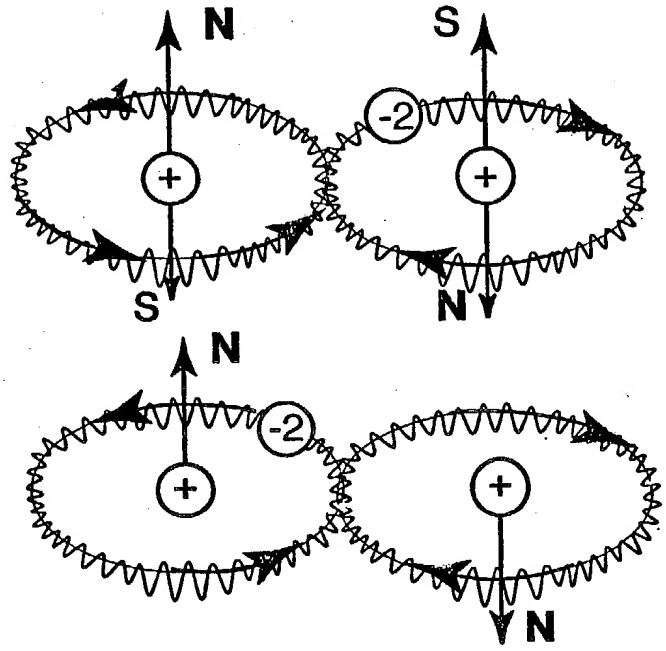


FIGURE 2.3: A schematic view of the most elementary possible gas magnecule (2.4), $\{H_{\uparrow}-H_{\downarrow}\}\times\{H_{\uparrow}-H_{\downarrow}\}$, here assumed to be formed at absolute zero degree temperature and in the absence of all collective motions. Note that the hydrogen molecule has no IR signature. Thus, the entire magnecule of this figure is therefore predicted to have no IR signature at all. Elementary magnecule (2.4) is therefore an exception to the general rule of Definition 2.1 according to which the only IR signatures of magneclusters are those of their molecular constituents. At ordinary temperature the magnecule acquires a conventional spherical shape due to rotations and other motions of the structure as a whole with comparatively ignorable relative motions between the two molecules.

Note that, once formed, magnecule (2.4) will indeed admit rotations, vibrations, and all conventional motions due to temperature, but as a single entity, with comparatively ignorable relative motions between the two molecules due to the strength of the bond.

A structure similar to (2.4) then holds for the remaining magnecules (2.1)–(2.3). For examples, another elementary gas magnecule is characterized by the polarizations

$$\{ H_{\uparrow} - H_{\downarrow} \} \times \{ C_{\uparrow} - O_{\downarrow} \} ; \tag{2.5}$$

and a generic gas magnecluster then has the structure (see Fig. 2.3)

$$\{ H_{\uparrow} - H_{\downarrow} \} \times \{ C_{\uparrow} - O_{\downarrow} \} \times \{ H_{\uparrow} - O_{\downarrow} - H \} \times \{ H_{\uparrow} - C_{\downarrow} - A - B - C \ldots \} \times \ldots \tag{2.6}$$

where A, B, C, are generic atoms in a conventional molecular chain and the atoms without an indicated magnetic polarity may indeed be polarized but are not necessarily bonded because of said geometric distribution in space.

Note that magnecule (2.4) may well have been detected several times in mass spectrometric measurements, but believed to be the helium (because its molecular weight is close to that of the helium). This case suggests that spectrometric studies of the new species should not be conducted unless the mass spectrometer (MS) is equipped with an infrared detector (IRD) for gases or ultraviolet detector (UVD) for liquids.

Recall that the hydrogen has no IR signature. Therefore, the IRD is expected to establish the *lack* of any IR signature of magnecule (2.4), while the helium has a well defined and known IR signature. Lacking the IRD in the MS instrument one may end up in the "experimental belief" that the detected peak is that of the helium, while the scientific reality may be dramatically different.

In view of the above occurrence, ***in this analysis I shall, therefore, primarily use experimental evidence based on MS data complemented with IR data for gases or UV data for liquids, and consider as nonscientific possible MS dismissal of the new species with instruments without said IRD or UVD.***

2.5. Numerical value of the magnetic moment of polarized electrons orbits. The calculation of the value of the magnetic moment of the orbits of the isoelectronium polarized in a fixed plane is truly elementary, but not

available in any book in quantum mechanics and chemistry I could inspect, as indicated earlier.

More specifically, the *laws* governing magnetic moments are well established in the literature. What is missing is their specific application to the *orbits* of the electrons beginning with that of the ground state of the hydrogen atom, let alone that for more complex atoms.

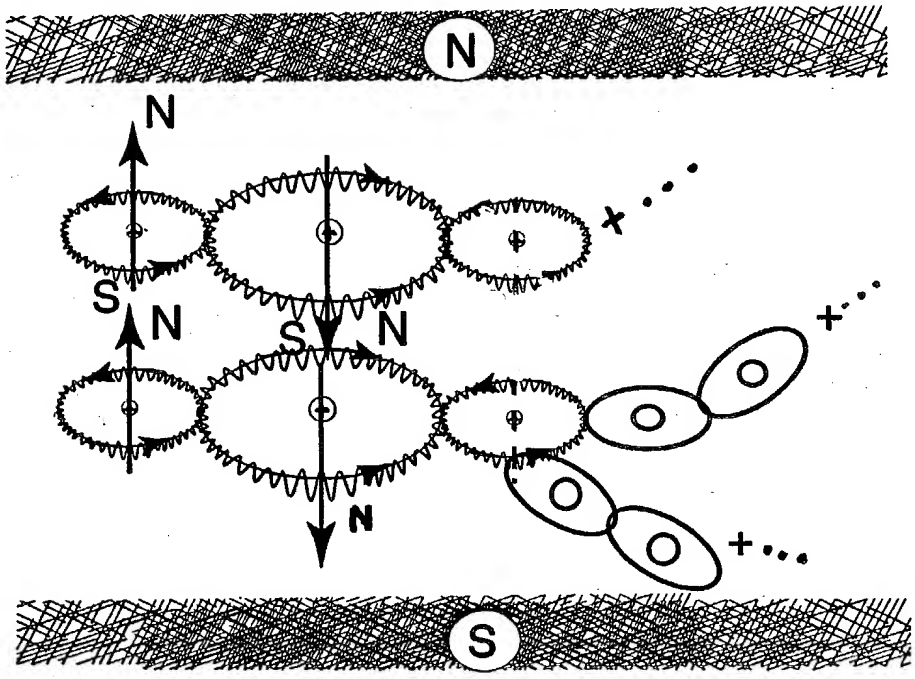


FIGURE 2.3: A schematic view of a generic magnecule (a magnecluster according to Definition 2.1) with constituent molecules in which only two dimers are magnetically bonded, while the remaining atoms of the molecules are not bonded due to their space geometry or other reasons.

By using the rationalized systems of units, the magnetic moment M of a polarized orbit of the isoelectronium is given by the general quantum mechanical

law

$$M_{isoel.} = \frac{q}{2m} L\mu , \tag{2.7}$$

where L is the angular momentum, μ is the rationalized unit and, from data (1.1), $q = -2e$ and $m = 2m_e$.

By plotting the various numerical values for the ground state of the isoelectronium in the hydrogen atom, I obtain

$$M_{isoel.} = 1,85.9590\ \mu . \tag{2.8}$$

By recalling that in the assumed units the proton has the magnetic moment 1. 4107 μ, we have the ratio

$$\frac{M_{Isoel.}}{M_{Proton}} = \frac{1,856.9590}{1.4107} = 1,316.3387 , \tag{2.9}$$

namely, ***the magnetic moment of the polarized orbit of the isoelectronium in its ground state for the hydrogen atom is 1,316 times bigger than the magnetic moment of the nucleus (the proton).***

Due to its large numerical value, result (2.9) is amply sufficient to provide the theoretical foundations for the existence of the new chemical species of magnecules.

Recall from Paper II that the ground state of the isoelectronium in the hydrogen atom is *different* than that of the electron. Despite that, the two magnetic moment coincide.

In fact, angular momenta have the structure $r \wedge p$; the orbit of the isoelectronium is expected to be 1/4 that of the electron, while its linear momentum is double in value. By plotting these data in Eq. (2.7) it follows that *the magnetic moment of the isoelectronium in its ground state polarized orbit for the hydrogen molecule as per Eq. (2.7) coincides with the magnetic moment of the ordinary electron in its own ground state in the same hydrogen atom, besides the presence in the latter case of the intrinsic magnetic moment of the electron (which must evidently follow the same polarization of the orbit)*

It then follows that ***the conventional model of the hydrogen molecule implies a total value of the magnetic moment for the polarized ground state***

electron orbit in the hydrogen atom much bigger than the corresponding value for the isochemical model of the same molecule, due to the additional presence of the intrinsic magnetic moment of the electron.

In short, the conventional quantum chemical model of molecular bonds would predict a *bigger magnetic bond* than that predicted by hadronic chemistry. Nevertheless, this prediction will not be considered in this study due to the inconsistencies of quantum chemistry identified in Sect. 1.

Due to the conceptual, theoretical and experimental implications of Value (2.9), its independent verifications of its are solicited.

3. EXPERIMENTAL EVIDENCE OF MAGNECULES IN GASES AT TOUPS TECHNOLOGY CORPORATION.

3.1. Creation of magnecules in gases. I first proposed the existence of magnecules to, and several independent experimental verifications have been first established at the U. S. public corporation *TOUPS TECHNOLOGY LICENSING* (TTL) of Largo Florida (see the Company's Web Site [6a]). This section is devoted to an outline these developments.

During my studies on hadronic mechanics, I predicted the formation of magnecules in gases exposed to intense magnetic fields. I therefore searched for specific cases in which these conditions are met.

It was easy to see that one of the strongest, readily available sources of magnetic fields in gases is *an electric discharge*. I therefore predicted that magnecules exist in gases created by an electric discharge which are generally combustible. A similar prediction holds for liquids, as we shall see in Sect. 4.

I use the generic name of ***MagneGas*** to denote combustible gases created under or treated via a magnetic field sufficient to produce detectable magnecules. I use the term ***MagneFuel*** (or ***MagFuel*** for short) to include liquids with the same characteristics. Some of the MagneGases known to me are:

A) The gas patented by I. Eldridge in 1898 [7a];

B) The gas patented by W. A. Dammann and D. Wallman also in 1995 [7db];

C) The gas patented by W. J. Richardson, jr., in 1995 [7c] called AquaFuel^{TM};

D) The so–called Brown gas [7d] ;

E) The SkyGas [7e];

and others.

In general, an electric discharge is in a liquid essentially consisting of tap

water, carbon and other soluble substances, decomposes the water and other substances by forming a plasma at about 5,000 C of mostly ionized atoms of hydrogen, oxygen, carbon and possibly other elements which combine in a variety of ways, forming nonexplosive combustible gases with clean emission exhausts. The new gases cool down in the surrounding water, and bubble to the surface where they are collected with various means.

The main hypothesis I formulated in early 1998 is that at the time of their formation, gases H_2, CO, CO_2, O_2, etc. *do not* have a conventional structure because the orbits of (at least) their valence electrons are polarized (cyclotron resonance orbit) due to the very intense magnetic field surrounding the discharge (of the order of 10 Tesla). In turn, such a polarization implies the creation of the strong magnetic moments of Sect. 2.5, resulting a new magnetic bonds constituting the magnecules as per Definition 2.1.

While conducting these studies, I had the opportunity of visiting in early 1998 TTL where I met Mr. ***Leon Toups,*** President, Mr. ***Mark Clancy,***Mr. ***Michael Toups*** and Mr. ***Jerry Kammerer,*** Vice Presidents, Mr. ***William H. Richardson, jr.,*** Mr. ***Ken Lindfors,*** Mr. ***Jack Hansen*** and other TTL engineers.

In this way I had the opportunity of seeing the production of AquaFuel, a new, safe, clean, combustible gas under development by TTL, which is produced quite simply via an electric discharge on carbon rods within ordinary tap water.

It was evident that the electric discharge decomposes the carbon rod, and creates a high temperature plasma of mostly ionized atoms of hydrogen, oxygen and carbon. In view of their affinity, carbon combines with virtually all available oxygen, thus resulting in a nonexplosive combustible gas, essentially composed by magnetically polarized molecules H_2, CO, CO_2 and their magnetic bonds. The resulting gas has some of the cleanest exhausts available in the fuel industry (see Web Site [6b] for details).

Immediately following my visual inspection of AquaFuel, I indicated to Mr. ***Leon Toups*** and other TTL members the hypothesis that the chemical structure of AquaFuel is anomalous, that is, *not representable with quantum chemistry.* This hypothesis was fully supported by Mr. ***W. Richardson, jr.,*** because of his years of unsuccessful and frustrating attempts in trying to understand AquaFuel via conventional chemical analyses and related quantum chemistry.

In fact, several conventional mass spectrometric analyses on AquaFuel conducted at conventional high temperatures, after adjustments due to possible air contamination (indicated by nitrogen content) and averaging over various methods of production, suggested the following

Conventional chemical composition of AquaFuel:

H_2	50 %	
CO	40 %	
CO_2	9 %	(3.1)
O_2	0.2 %	
Misc. struct. in ppm	0.8 %	

However, the above chemical analysis was in dramatic disagreement with a variety of experimental evidence on AquaFuel reported in detail in Web Site [6b], such as: irreconcilable difference between the energy content of AquaFuel predicted by chemical composition (3.1) and the experimental evidence (see also Sect. 3.4); existence of large clusters in AquaFuel following filtration of light gases; numbers of octanes; and others.

I therefore conjectures that AquaFuel is indeed composed by the gases according to analysis (3.1), but all of them are magnetically polarized due to the high magnetic field of the electric discharges that produces them, thus resulting in a *new* chemical structure with generic magnecules

$$\{H_\uparrow - H_\downarrow\} \times \{H_\uparrow - H_\downarrow\}\,, \quad \{C_\uparrow - O_\downarrow\} \times \{C_\uparrow - O_\downarrow\}\,, \quad \{O_\uparrow - O_\downarrow\} \times \{O_\uparrow - O_\downarrow\}\,, \text{ etc.}\,, \tag{3.2a}$$

$$\{H_\uparrow - H_\downarrow\} \times \{H_\uparrow - H_\downarrow\} \times \{H_\uparrow - H_\downarrow\} \times \ldots, \{C_\uparrow - O_\downarrow\} \times \{C_\uparrow - O_\downarrow\} \times \{C_\uparrow - O_\downarrow\} \times \ldots, \text{ etc.} \tag{3.2b}$$

$$\{H_\uparrow - H_\downarrow\} \times \{C_\uparrow - O_\downarrow\} \times H_\uparrow \times \{O_\uparrow - C_{\downarrow\uparrow} - O_\downarrow\} \times O_{\uparrow\uparrow} \times \{O_\uparrow - O_\downarrow\} \times C_{\uparrow\uparrow} \times \ldots, \text{ etc.}\,, \tag{3.2c}$$

where one should note the expected presence of individual polarized *atoms*, besides polarized molecules.

I therefore recommended to TTL the conduction on AquaFuel of comprehensive scientific measurements, such as those via suitably supervised Gas Chromatographic Mass Spectroscopic (GC–MS) equipment; energy content; octanes; permeability; etc. All these measurements were expected to be anomalous, thus providing the foundations of possible ***new technology*** on magnetically polarized gases of possible direct industrial relevance for TTL.

Mr. ***Leon Toups*** and all other TTL officers and members provided all possible financial, technical and logistic assistance for the conduction of the proposed scientific measurements which resulted to be invaluable for the achievement of the results presented in this study.

One should note the *corporate* origin of the above support for the search of basically *new* scientific knowledge, that is, knowledge beyond pre–existing

doctrines, which acquires particular significance when considering the notorious impossibility of seeking basic *new* knowledge in the contemporary academic environment.

In this section I report the experimental verifications on the existence of magnecules in AquaFuel achieved thanks to TTL support. Additional experimental verifications are under way at this writing and they will be reported in future papers.

3.2. Anomalies of magnecules to be measured. The hypothesis of magnecules in gases implies the expectation of numerous anomalies in various fields (mass spectrometry, thermochemical behavior, physical characteristics, etc.), such as:

Anomaly 3.1: Appearance of unexpected heavy MS peaks.

Gas magnecules are generally heavier than the heaviest molecule in a given gas. Peaks in the GC–MS are therefore expected in macroscopic percentages with molecular weights bigger than the heaviest molecule. These heavy composites should not provide MS peaks according to quantum chemistry, thus constituting an anomaly. As an illustration, the heaviest AquaFuel molecule in macroscopic percentages is CO_2, Eq. (3.1), which has molecular weight 44 a.m.u. By ignoring heavy compounds in parts per million (ppm), AquaFuel should have no large peak in the GC–MS with more than 44 a.m.u. The existence of heavier large peaks would establish this first anomaly.

Anomaly 3.2: "Unknown" character of the unexpected peaks.

To provide the initial premises for magnecules, the peaks of Anomaly 3.1 should result be "unknown" in the search by the GC–MS computer in its memory banks of conventional molecules, usually including about 150,000 molecules.

Anomaly 3.3: Lack of IR signature of the "unknown" peaks.

Another necessary condition to have magnecules is that the "unknown" peaks of Anomaly 3.1 should have no infrared signature at all. According to established evidence, all gases with a valence bond must have a well defined infrared signature (with a few exception of spherically symmetric molecules such as H_2). In the event the peaks of Anomaly 3.1 do have such a signature, they can be constituted by new yet conventional molecules not identified before. The only infrared signatures of any given gas magnecule should be those of the *conventional* molecules and atoms constituting the cluster itself. As an illustration, the only admissible infrared signatures of magnecule $\{O_{\uparrow}–O_{\downarrow}\}\times\{C_{\uparrow}–O_{\downarrow}\}$ are those of the conventional molecules O–O and C–O.

Anomaly 3.4: Mutation of conventional IR signatures.

The infrared signatures of the molecules constituting a magnecules are expected to be *mutated*, in the sense that the shape of their peaks is not the established one. This is another necessary condition for the existence of magnecules requested by the polarization of the orbits of the valence electrons. In fact, this polarization implies space distributions of the orbitals different than the conventional ones, thus resulting in a deformation of the shape of the IR peaks. Moreover, the same polarizations are expected to create additional strong bonds within a *conventional* molecule, which are expected to appear as new IR peaks. Still in turn, such an *internal mutation of conventional molecules* as far reaching scientific and technological implications, as we shall see.

Anomaly 3.5: Mutation of magnecules.

While molecules preserve their structure at conventional temperatures and pressures, this is not the case for magnecules which are expected to *mutate* in time, that is, to change the shape of the MS peaks due to change in their constituents. Since we are referring to gases whose constituents notoriously collide, magnecules can break-down during collisions into parts which can then recombine with other magnecules to form new structures. Alternatively, magnecules are expected to experience accretion (or emission) of polarized conventional atoms or molecules without necessarily breaking down into parts. It then follows that the peaks of Anomaly 3.1 are not expected to remain the same over a sufficient period of time for the same gas under the same conditions.

Anomaly 3.6: Mutated physical characteristics.

Magnetically polarized gases are expected to have mutated physical characteristics because the very notion of polarization of the orbits implies a *smaller* average molecular volume. Mutation of other physical characteristics is then consequential.

Anomaly 3.7: Increased adhesion.

Magnetically polarized gases are expected to have a increased adhesion to walls of disparate nature as compared to the same unpolarized gas. This is due to the well known property that magnetism can be propagated by induction according to which a magnetically polarized molecule with a sufficiently intense magnetic moment can induce a corresponding polarization of valence (and/or other) electrons in the atoms or molecules constituting the walls surface. Once such a polarization is created by induction, magnecules can have rather strong magnetic bonds to said walls.

Anomaly 3.8: Increased penetration through substances.

Magnetically polarized gases are expected to have absorption or penetration through other substances . This is first due to the reduction of the average

molecular volume with inherent increase of permeability as compared to the same unpolarized gas. The second reason is the magnetic induction of the preceding anomaly.

Anomaly 3.9: Increased energy release.

Magnetically polarized gases are expected to have thermochemical reactions with macroscopic increases of energy releases as compared to the same reactions among unpolarized gases, an expected anomaly which, alone, has large scientific and industrial significance.

All the above anomalies are expected to disappear at a sufficient high temperature, evidently varying from gas to gas (Curie point), while the anomalies are expected to be enhanced at lower temperature and survive liquefaction.

Thanks to the invaluable financial, technical and logistic support by Mr. ***Leon Toups,*** TTL President, my main task in 1998 has been that of providing scientific evidence by independent laboratories for the above anomalies.

The task has been rendered difficult by the fact that most conventional analytic equipment and methods have been developed for *conventional* properties. As such, they are expected to be ineffective for the measurements of *anomalous* properties.

Evidently, Anomalies 3.1 through 3.6 should be established via GC–MS. However, most GC–MS machines are not suitable to detect magnecules, and the few that are suitable should be operated in a way significantly different than the conventional one (otherwise the magnecules would have been discovered long ago).

More specifically, the ***necessary conditions for measurements of magnecules with gas chromatographic, mass spectroscopic equipment are the following:***

Condition 3.1: The GC-MS should permit measurements of peaks at ordinary temperature (say, 10 C - 30 C) and the feeding lines should be cryogenically cooled. By comparison, GC–MS are routinely operated at temperatures of the order of 150 C to 250 C for which no magnecule is expected to exist. To put it explicitly, the conventional operation of GC–MS destroys the very clusters to be detected, and this identifies a first reason for the lack of detection of magnecules until now.

Condition 3.2: GC-MS used for measurements of magnecules should be equipped with the InfraRed Detector (IRD). In its absence,

no scientific measurement should be considered as final (because of the lack of 50% of the necessary measurements). To put this important point in plain language, measurements of magnetically polarized gases without the IRD can likely provide "experimental beliefs" without real scientific value due to "conventional interpretations" which are permitted precisely by the absence of IR data. On the contrary, data indicating the absence of IR signature for a given peak at the MS would discredit such "conventional interpretations" as nonscientific because, as indicated earlier, conventional molecules have an IR signature with only a few exception. Following a laborious search, I discovered that virtually all GC–MS in academic laboratories *are not* equipped with IRD (because academicians assume to be able to identify substances from their MS data only). This second main requirement virtually rules out the use of GC–MS in academic laboratories for the detection of the new species, and provides an additional reason why the magnecules have not been detected in academic laboratories so far. In reality, as we shall see, numerous magnecules have been indeed detected in academic laboratories, but were misinterpreted as esoteric molecules precisely because of the lack of IRD.

Condition 3.3: The GC-MS/IRD should be equipped with the largest possible feeding line with at least 0.5 mm ID. By comparison, GC–MS are usually operated with feeding lines with the smallest possible ID, at times of the order of 0.1 mm. This additional unusual requirement is due to Anomaly 3.7, i.e., the enhanced adhesion of magnecules to the walls of the feeding line which, in this way, becomes clogged up to the point of preventing the passage of the most interesting magnecules, the big magneclusters (Definition 2.1). This is another condition analysts with extended practice on *conventional* gases can only accept after being exposed to the evidence. The requirement is due to the fact that magnecules have the tendency to aggregate themselves in large clusters, some of which are so big to be visible to the naked eye (particularly in liquids, as shown in the next section). The use of the smallest possible feeding line, while fully acceptable for conventional gases, generally prevents the most interesting magnecules to even enter the instrument, let alone to be detected.

Condition 3.4: The GC-MS should be set to detect peaks at molecular weights where the analyst usually expects none. This condition identifies another reason why magnecules have simply not been looked for until now. As an illustration, the most interesting molecular weights for AquaFuel are those *bigger* than their heaviest conventional molecule, i.e., bigger than 44 a.m.u. It goes without saying that smaller molecular weights are also

important once the analyst *seeks an anomaly*, rather than a conventional setting. In fact, one of the most important magnecules is structure (2.4) at about 4 a.m.u composed by two hydrogen molecules.

Condition 3.5: The ramp time should be the longest admitted by the GC-MS/IRD and of at least 25 minutes. In general, for the evident reason to reduce costs, the ramp time is set at the smallest possible operational value, which is perfectly acceptable for conventional gases, but substantially inappropriate for the anomalies we have to detect. As we shall soon see, for the case of magnetically polarized gases a small ramp time implies the clustering of all magnecules into one single peak. The analyst then looks at each individual constituent of such a unique large peak and find fully conventional molecules, thus reaching the "experimental belief" of facing a conventional molecular structure. For a sufficiently large ramp time the magnecules are instead well separated, thus permitting the analyst to see their individual existence and therefore establish their individual lack of the valence structure via MS and IR data.

Numerous other conditions exist for GC–MS/IRD to be effective in the detection and identification of magnecules. They are of more technical nature and will be indicated whenever needed.

Besides the problems in identifying an appropriate GC–MS/IRD, I experienced additional difficulties in the identification of other instruments capable of providing effective measurements of the other Anomalies 3.7–3.–3.9, again, because the available instruments have been designed for the measurement of *conventional* rather than anomalous features.

As an illustration, by far the most difficult measurement of AquaFuel features has been the achievement of credible scientific values of its energy content in British Thermal Units (BTU) per cubic foot (cf). By comparison, the measurement of the BTU/cf of ordinary gases is so elementary nowadays to be computerized following GC–MS data.

Significantly, *all* methods currently available to measure the BTU/CF of AquaFuel failed to provide results of any credibility (this is the case of computerized computation of BTU/cf from GC–MS results) and some conventional calorimeters did not even allow AquaFuel to burn, let alone to make a measurement (this is the case of the computerized calorimeters for methane whose air intake is too big for the combustion of AquaFuel and its required adjustment outside the range of the computer program).

Equal difficulties were encountered via the use of EPA analytic techniques,

evidently because they are not designed to detect anomalies.

3.3. Spectroscopic evidence of magnecules in gases. After a laborious search in the U.S.A., I located a GC–MS equipped with IRD suitable to measure magneclusters at the ***McClellan Air Force Base*** in North Highland, near Sacramento, California. Thanks to the invaluable assistance and backing by TTL, I was authorized to conduct GC–MS/IRD measurement on AquaFuel at that facility.

Following the prior arrival of a bottle of AquaFuel, on June 19, 1998, I visited the analytic laboratory of *NATIONAL TECHNICAL SYSTEMS* (NTS) located at said McClellan Air Force Base. The measurements on AquaFuel were conducted by analysts ***Louis A. Dee,*** Branch Manager, and ***Norman Wade*** who operated an HP GC model 5890, an HP MS model 5972, and an HP IRD model 5965. Upon inspection, the instrument meet all conditions 1–5 of Sect. 3.2. I therefore authorized the measurements.

Thanks to a professional cooperation by the analysts, the equipment was set at all the unusual conditions indicated in Sects. 3.2. In particular, the equipment was set for the analytic method VOC IRMS.M utilizing an HP Ultra 2 column 25 m long with a 0.32 mm ID and a film thickness of 0.52μm. I also requested to conduct the analysis from 40 a.m.u. to the instrument limit of 500 a.m.u. This condition was necessary to avoid the CO peak of AquaFuel at 28 a.m.u. which is so large to dwarf all other peaks.

Moreover, the equipment was set at the lowest possible temperature of 10 C; the biggest possible feeding line with an ID of .5 mm was installed; the feeding line itself was cryogenically cooled; the equipment was set at the longest possible ramp time of 26 minutes; and a linear flow velocity of 50 cm/sec was selected. A number of other technical requirements are available in the complete documentation of the measurements reproduced in App. A of Ref. [3e].

The analysts first secured a documentation of the background of the instrument prior to any injection of AquaFuel in view of Anomaly 3.7 which is evidently expected to alter the background due to anomalous residues of the AquaFuel in the instrument after the completion of the tests.

Following a final control that *all* requested conditions were in place, NTS analysts ***Louis A. Dee*** and ***Norman Wade*** injected AquaFuel into the HP GC–MS/IRD and initiated the tests.

As one can see, the results constitute the first direct experimental evidence on the existence of magnecules.

After waiting for the 26 minutes of the ramp time, ***sixteen heavy anomalous***

peaks appeared in the MS screen, thus providing direct experimental verification of Anomaly 3.1 (Fig. 3.1).

AquaFuel contains from 5% to 7% of CO_2 as per various chemical analyses conducted at high temperature [6b]. The spectrum of Fig. 3.1 is from 40 a.m.u. to 500 a.m.u. Comparative inspection of the various peaks and their size then establishes that they represent macroscopic percentages of compounds in AquaFuel which, according to quantum chemistry, should not exist, thus providing experimental evidence for Anomaly 3.1 beyond scientific doubt.

I should report that, at the appearance of the peaks of Fig. 3.1, analyst ***Norman Wade*** stated "I have not seen something like these peaks in twenty five years of analyses".

The analysts then passed to the identification of the individual peaks of Fig. 3.1. As illustrated in Fig. 3.2 (see the complete documentation of Ref. [3e] for more data), ***all sixteen peaks of Fig. 3.1 resulted to be "unknown" following the computer search in the memory banks of the McClellan Air Force Base comprising about 140,000 molecules, thus providing direct experimental verification of Anomaly 3.2.***

After completing and documenting the MS data, the analysts passed to measurements at the IRD. To their surprise, ***none of the peaks of Fig. 3.1 had any infrared signature at all, thus providing direct experimental verification of Anomaly 3.3*** (Fig. 3.3). The IR scan for the MS peaks of Fig. 3.1 only shows a peak clearly belonging to CO_2, namely, to one of the *components* of the peaks of Fig. 3.1. The IR signature of the other components do not appear in Fig. 3.3 because they are behind the left margin of the scan. Note also that there is no identifiable CO_2 peak in the MS spectrum of Fig. 3.1.

The analysts then established (Fig. 3.4) that ***the IR peak of CO_2 is itself anomalous (mutated), thus providing experimental evidence for Anomaly 3.4.***

This result is most intriguing inasmuch as it provides ***experimental evidence for a mutation of the structure of conventional molecules with the presence of an additional strong internal binding force also expected to be of magnetic type which, in turn, is expected to imply an increased energy content.***

To appraise the implication of this aspect alone, one should meditate a moment on the fact that it provides ***experimental evidence on the polarization of the orbits of internal non-valence electrons***, evidently because valence electrons cannot provide any additional molecular bond for both conventional and hadronic chemistry.

The analysts also inspected small peaks in the IR scan, and they all resulted to be "unknown", as shown in Fig. 3.5, thus completing the experimental evidence

of the anomalous IR behavior.

Following the measurements, I received the following signed report dated June 23, 1998 (see the original in App. I of Ref. [3f]):

"Dear Dr. Santilli,

Thank you for the opportunity to provide analytic data on AquaFuel™. Attached are all GC-MS and concomitant GC-IR data that we obtained for the unfiltered sample.

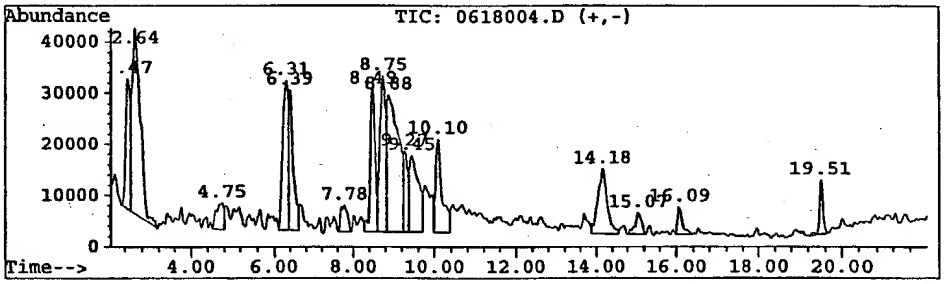
... Our blank runs obtained before and after the analyses show no high mass spectra, thus proving that the high molecular weight species found were actually in the AquaFuel™ sample.

.... Search results using a library of 138,000 chemical compounds, did not indicate any matches with this high molecular weight species found in AquaFuel™.

Based on the limitations of our equipment and our inability to find a library match, the identification of this mysterious AquaFuel™ ingredient is an unknown."

National Technical Systems
Louis A. Dee
Branch Manager"

```
Information from Data File:
File       : C:\HPCHEM\1\DATA\0618004.D
Operator   : NAW
Acquired   : 18 Jun 98   3:01 pm using AcqMethod VOC_IRMS
Sample Name: TOUP'S TECH
Misc Info  : 1ML LOOP; 10C @ ULTRA COLUMN
Vial Number: 1
CurrentMeth: C:\HPCHEM\1\METHODS\DEFAULT.M
```



Retention Time	Area	Area %	Ratio %
Total Ion Chromatogram			
2.474	1753306	5.386	32.724
2.644	5091514	15.641	95.030
4.754	641528	1.971	11.974
6.307	2737749	8.411	51.098
6.390	2211258	6.793	41.272
7.782	592472	1.820	11.058
8.490	2357396	7.242	43.999
8.754	2784829	8.555	51.977
8.882	5357812	16.460	100.000
9.265	1123809	3.452	20.975
9.448	2421234	7.438	45.191
10.098	1946292	5.979	36.326
14.177	2129791	6.543	39.751
15.073	435208	1.337	8.123
16.085	389822	1.198	7.276
19.509	577433	1.774	10.777

FIGURE 3.1: A reproduction of the MS peaks providing the ***first experimental evidence on the existence of magnecules*** identified on June 19, 1998, by analysts ***Louis A. Dee*** and ***Norman Wade*** of the branch of *NATIONAL TECHNICAL SYSTEMS* (NTS) located at the *MCCLELLAN AIR FORCE BASE* in North Highland, near Sacramento, California, under support from *TOUPS TECHNOLOGY LICENSING* (TTL) of Largo, Florida. The peaks refer to the combustible gas *AquaFuel*^{TM} under development by TTL, for molecular weights ranging from 40 a.m.u. to 500 a.m.u. AquaFuel is a *light* gas with only

CO_2 as the heaviest molecule in macroscopic percentage with a molecular weight over 40 a.m.u. [6]. Therefore, *only* the CO_2 peak should have appeared in the scan with any macroscopic size. On the contrary, the CO_2 peal is not identifiable at all in the scan; *all* sixteen peaks should not be present according to quantum chemistry; and the scan therefore provides the first direct experimental confirmation of Anomaly 3.1.

```
Library Searched : C:\DATABASE\WILEY138.L
Quality          : 37
ID               : Tris(methylseleno)[13C]methane
```

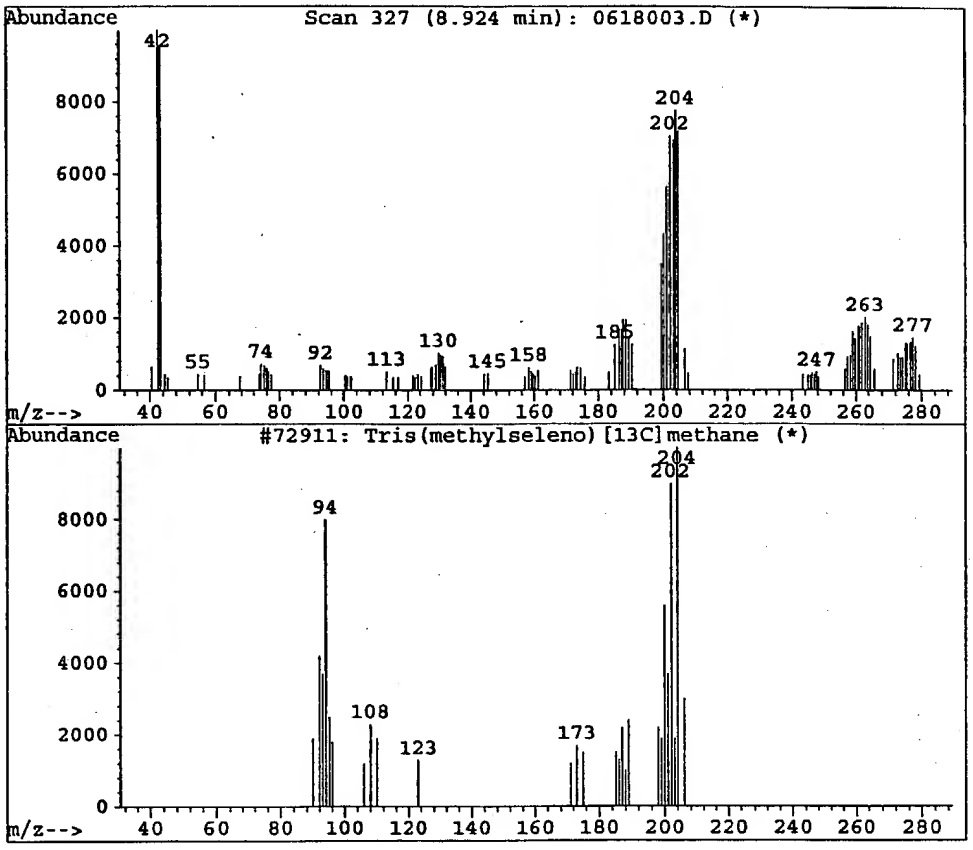


FIGURE 3.2: ***The first experimental evidence at NTS that the peaks of Fig. 3.1 are "unknown"***. The peak at the top is that at 8.924 minutes and that at the bottom shows the lack of its identification by the computer search. Note that, not only the best fit identified by the computer does not match the peak considered, but also the identified

substance (methylseleno) cannot possibly exist in AquaFuel because of the impossible presence of the necessary elements. Exactly the same situation holds for all remaining fifteen peaks of Fig. 3.1 (see the complete documentation in Ref. [3f]) which, therefore, remained "unknown", thus providing the first direct experimental verification of Anomaly 3.2.

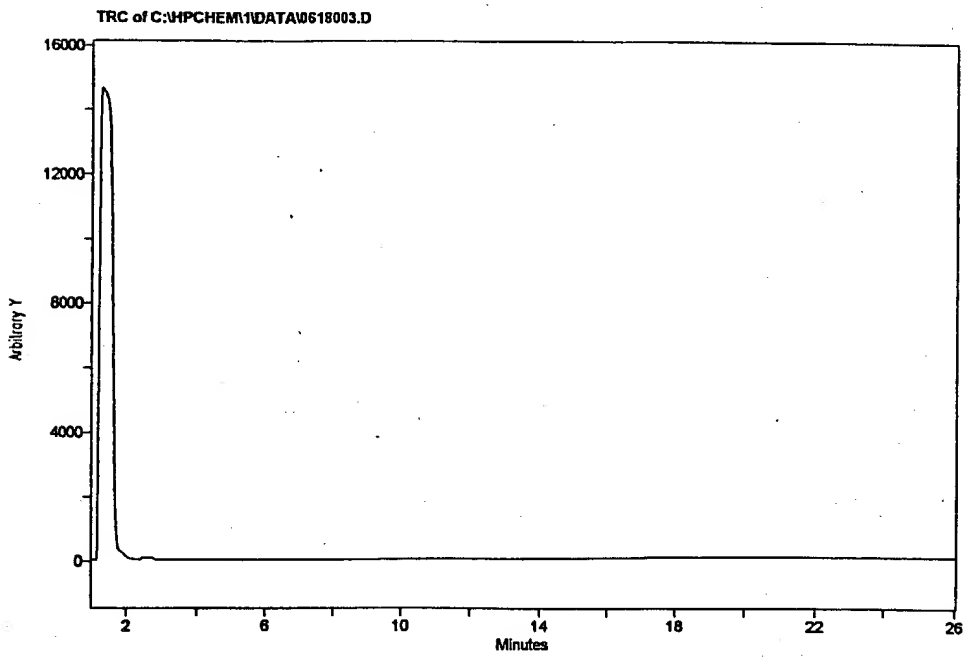


FIGURE 3.3: ***The first experimental evidence at NTS on the lack of IR signature of molecules,*** which establishes the existence of large peaks in the MS which have no IR signature at all. This provided the first direct experimental verification of Anomaly 3.3. The only IR signatures which are possible in AquaFuel are those for the *constituents* of the peaks of Fig. 3.1 which are ordinary gases such as O_2, CO, and CO_2. In the above figure only the IR signature of CO_2 appears because the scan was from 40 a.m.u. to 500 a.m.u. and, as such, could not include the IR signatures for O_2 and CO (H_2 has no IR signature).

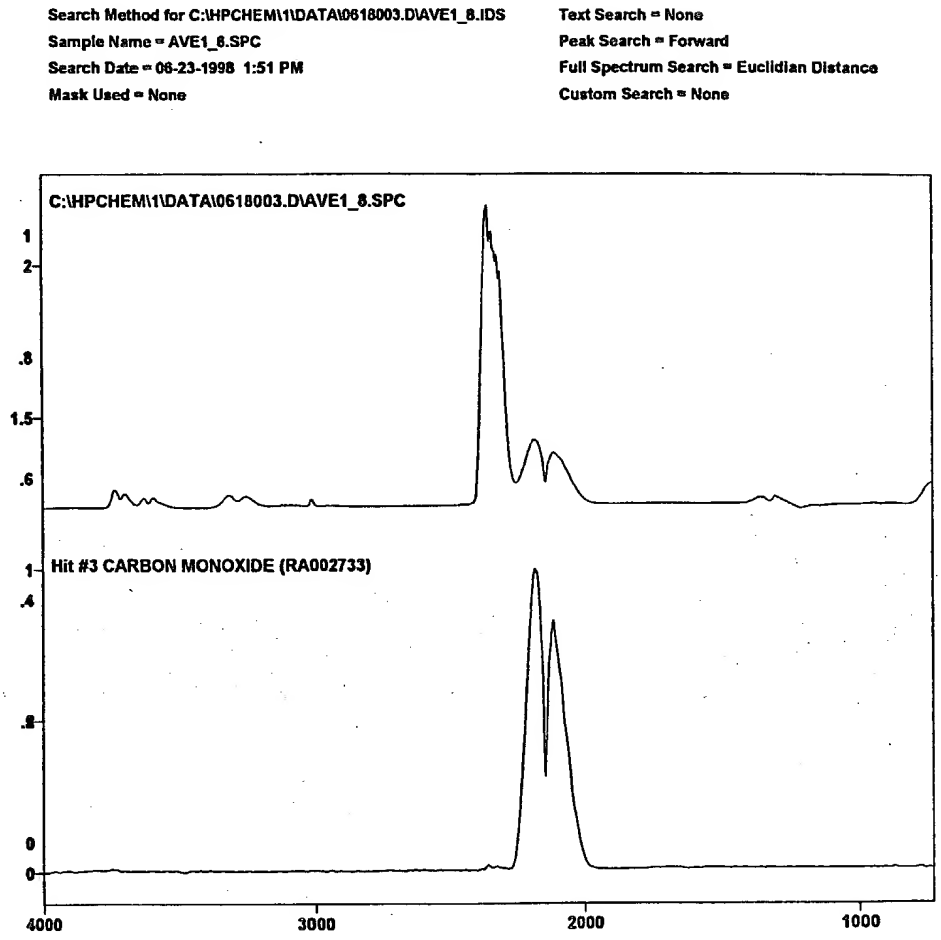


FIGURE 3.4: ***The first experimental evidence at NTS on the mutation of the IR signature of magnetically polarized conventional molecules,*** here referring to the CO_2 (top) compared to the conventional one (bottom). This provides the first direct experimental verification of Anomaly 3.4, namely, that *conventional* molecules composing AquaFuel have a deformed space distribution of their electrons, as necessary to have a polarization of their orbits. In turn, such deformations imply a necessary mutation of the IR signature. Note that the known, double-lobe PQR peak of CO_2 persists in the detected peak with the correct energy, and only with decreased intensity. Jointly, there is the appearance of a *new peak at higher energies on the left* which is

Jointly, there is the appearance of a *new peak at higher energies on the left* which is evidence of an extremely interesting *new internal bond within the conventional CO_2 molecule*, which evidently implies an increased energy content, thus establishing experimental foundations for a new technology of magnetically polarized gases with enhanced energy content (see Sect. 3.4). ***Note that the computer interprets the IR signature as belonging to CO which is erroneous since CO is out of the selected range. The signature is instead that of CO_2 as confirmed in subsequent tests (see Fig. 3.8).***

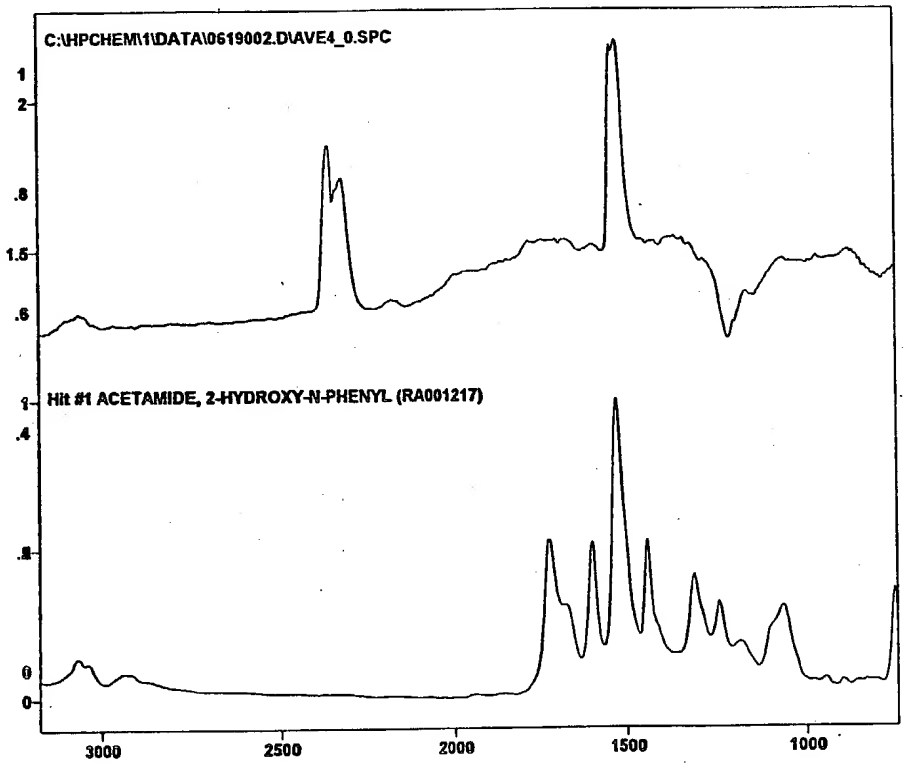


FIGURE 3.5: A reproduction of the lack of identification in the computer search of small peaks in the IR scan. The best possible match offered by the computer (lower peak) does not even partially recover the detected IR peak (top). At any rate, the suggested substance (Acetamide) cannot possibly exist in AquaFuel because of the lack of the necessary elements. All other smaller IR peaks remained equally unknown.

The measurements on the same sample of AquaFuel tested at NTS were repeated on July 25, 1998, by analyst ***Kevin Lothridge*** via a GC–MS/IRD located at the *PINELLAS COUNTY FORENSIC LABORATORY* (PCFL) of Largo, Florida, under TTL support (for complete documentation see App. II of Ref. [3f]).

The equipment consisted of an HP GC model 5890 Series II, an HP MS model 5970 and an HP IRD model 5965B. Even though similar to the equipment used at NTS, the PCFL equipment was significantly different inasmuch as the temperature had to be increased from 10 C to 55 C and the ramp time reduced from 26 minutes to 1 minute. The latter reduction implied the cramping of all peaks of Figure 3.1 into one single large peak, a feature confirmed by all subsequent GC–MS tests with short ramp time.

Despite these differences, the test at PCFL confirmed *all* Anomalies 3.1–3.4 first detected at NTS (see Figs. 3.6, 3.7, 3.8 and the complete documentation reproduced in Appendix B of Ref. [3e]). In addition, the tests provided the first experimental evidence of additional anomalies.

Following my request, analyst ***Kevin Lothridge*** conducted *two* MS tests of the *same* AquaFuel sample at *different times* about 30 minutes apart. As one can see in Fig. 3.9, ***the test at PCFL provided the first experimental evidence of Anomaly 3.5, the mutation in time of magnecules.*** In fact, the peak of Fig. 3.9 is macroscopically different than that of Fig. 3.6.

This provided evidence that, when colliding, magnecules can break down into ordinary molecules, atoms and fragments of magneclusters, which then recombine with other molecules, atoms and/or magnecules to form new unknown peaks. Equivalently, the experimental evidence establishes the expectation that mutation of magnecules can simply occur via the accretion of release of another polarized atoms or molecule without breaking down.

As one can see in Fig. 3.10, the tests conducted by analyst ***Kevin Lothridge*** also provided ***the first experimental evidence that the background following the end of the measurements resulted to be significantly similar to the MS scan, thus providing a direct experimental verification of Anomaly 3.7 on the increased adhesion of magnecules.***

The original background prior to the measurements with AquaFuel was re–obtained only after flushing the instrument with an inert gas at about 250 C. Such flushing heated the interior walls and parts of the instrument, thus breaking down all magnecules, terminating their anomalous adhesion and re–establishing their conventional molecular structure.

File : D:\IRDDATA\TTGAS.D
Operator :
Acquired : 25 Jul 98 11:08 am using AcqMethod HGAS
Instrument : 5970 - In
Sample Name: A-FUEL
Misc Info : KEVIN LOTHRIDGE
Vial Number: 1

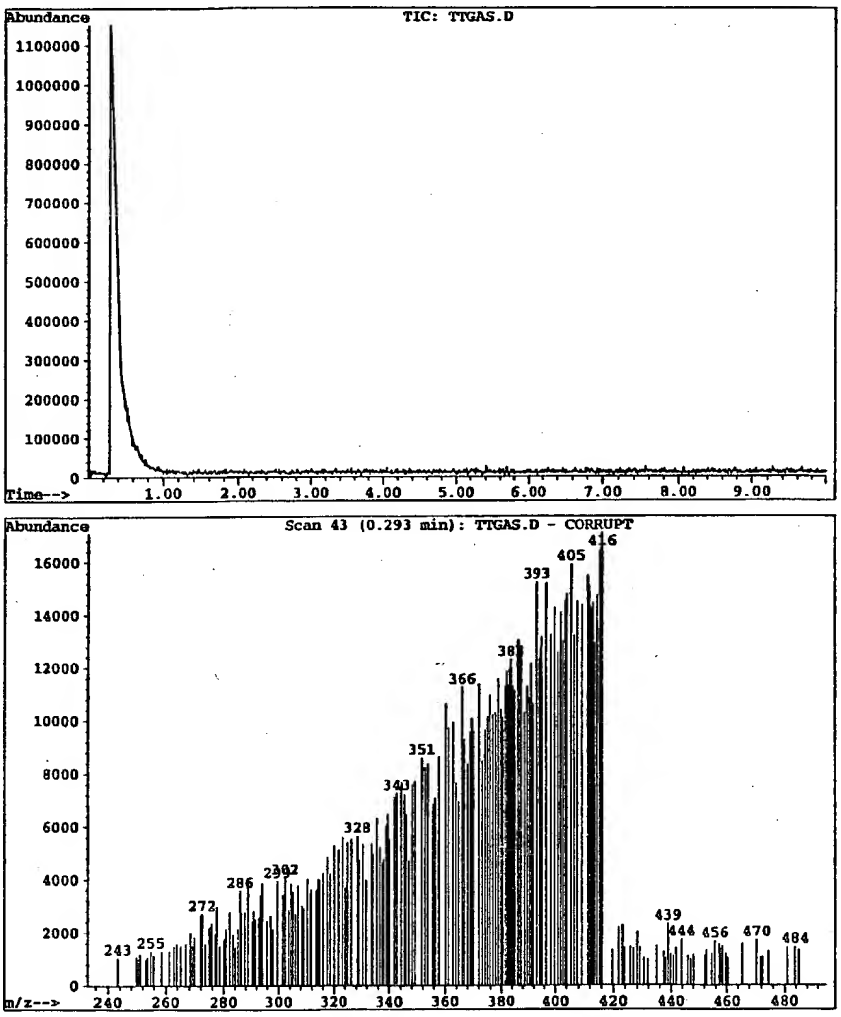


FIGURE 3.6. A view of the IRD scan (top) and MS spectrum (below) of AquaFuel conducted by analyst ***Kevin Lothridge*** on July 25, 1998, via a HP GC-MS/IRD located at the *PINELLAS COUNTY FORENSIC LABORATORY* (PCFL) of Largo, Florida, under support from *TOUPS TECHNOLOGY LICENCING* (TTL) also of Largo, Florida. As one can see, the scan confirms the anomalous peaks of Fig. 3.1 obtained at NTS which are clustered into

the single peak (bottom part of the above figure) due to the excessively short ramp time of 1 minute. The scan also confirms the results of Fig. 3.3 obtained by NTS on a crucial anomaly of magnecules, their lack of IR signature (top part of the figure). Note that, exactly as it was the case for the NTS measurements, the only IR signature is that of the CO_2 which does not appear in the MS scan as an isolated identifiable peak even though it is contained in AquaFuel for about 9 %.

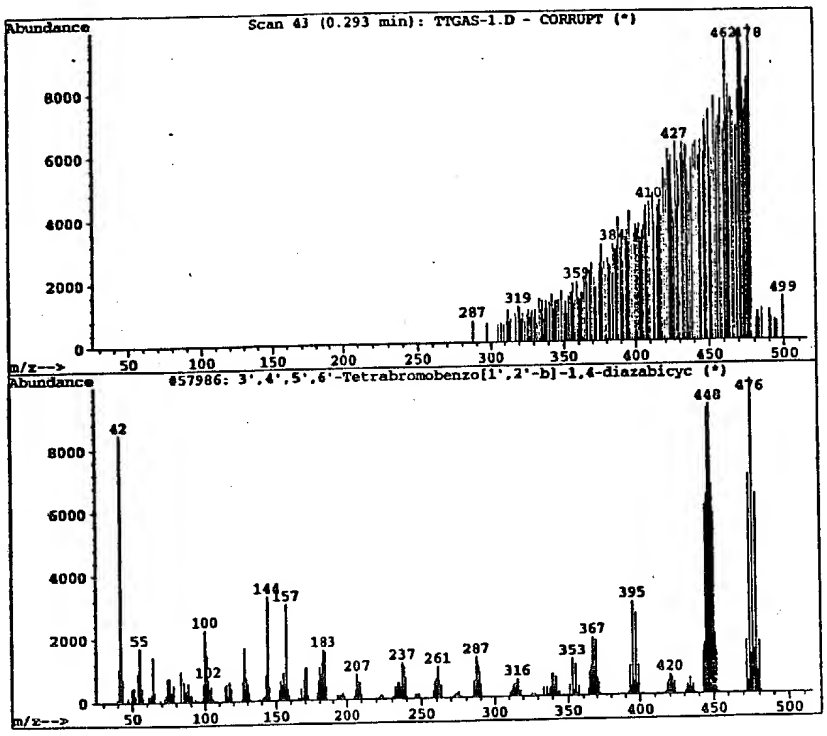


FIGURE 3.7: A confirmation at the PCFL of the NTS result of Fig. 3.2, the lack of identification by the computer search of the peaks in the MS (see App. II of Ref. [3f] for the complete documentation). Again, the substance selected by the computer as the best match (bottom) does not even approach the detected peak (top), besides being impossible for AquaFuel because of the lack of needed elements.

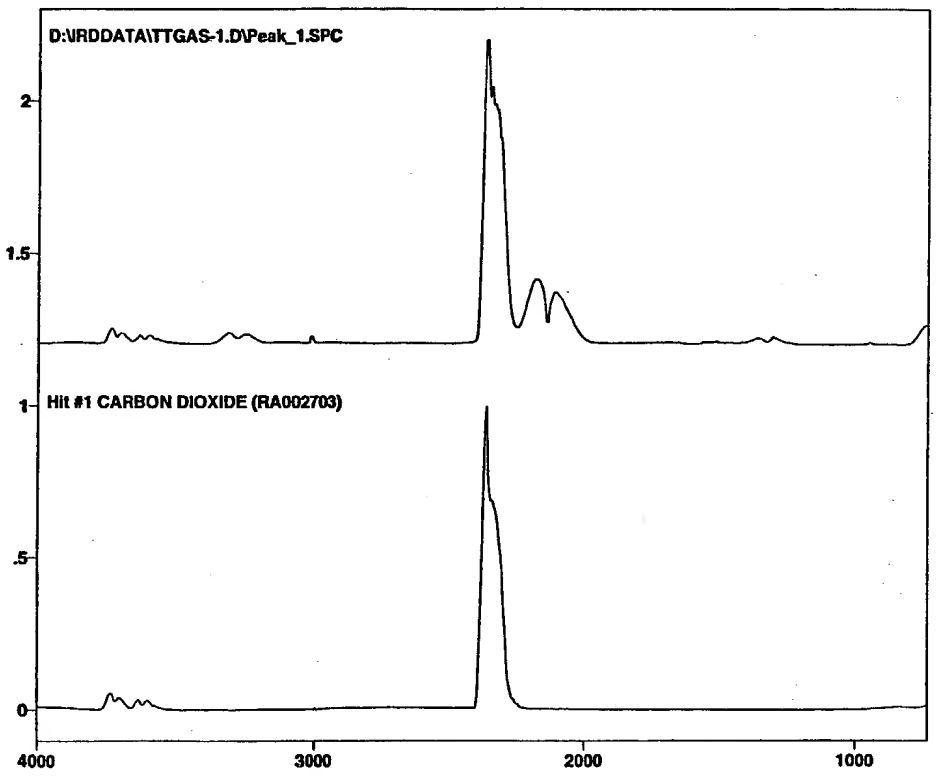


FIGURE 3.8: The independent confirmation at the PCFL of the NTS finding of Fig. 3.4 regarding the mutated IR signature of the CO_2 in AquaFuel. Note the identical shapes of the mutated IR peak in the top of the above figure and that in Fig. 3.4 obtained via a different instrument. Note the appearance again of two new peaks in the IR signature of CO_2, which indicate the presence of *new bonds* not present in the *conventional* molecule. The only interpretation known at this writing is that the intense magnetic field cause polarization of the orbits of internal non-valence electrons which, in turn, create internal new bonds of magnetic type. This is the only known interpretation of *the capability of the new technology of magnetically polarized gases of storing anomalous amounts of energy within conventional magnecules prior to or in addition to their magnetic bonds to other magnetically polarized molecules.*

File : D:\IRDDATA\TTGAS-1.D
Operator :
Acquired : 25 Jul 98 11:39 am using AcqMethod HGAS
Instrument : 5970 - In
Sample Name: A-FUEL
Misc Info : KEVIN LOTHRIDGE
Vial Number: 1

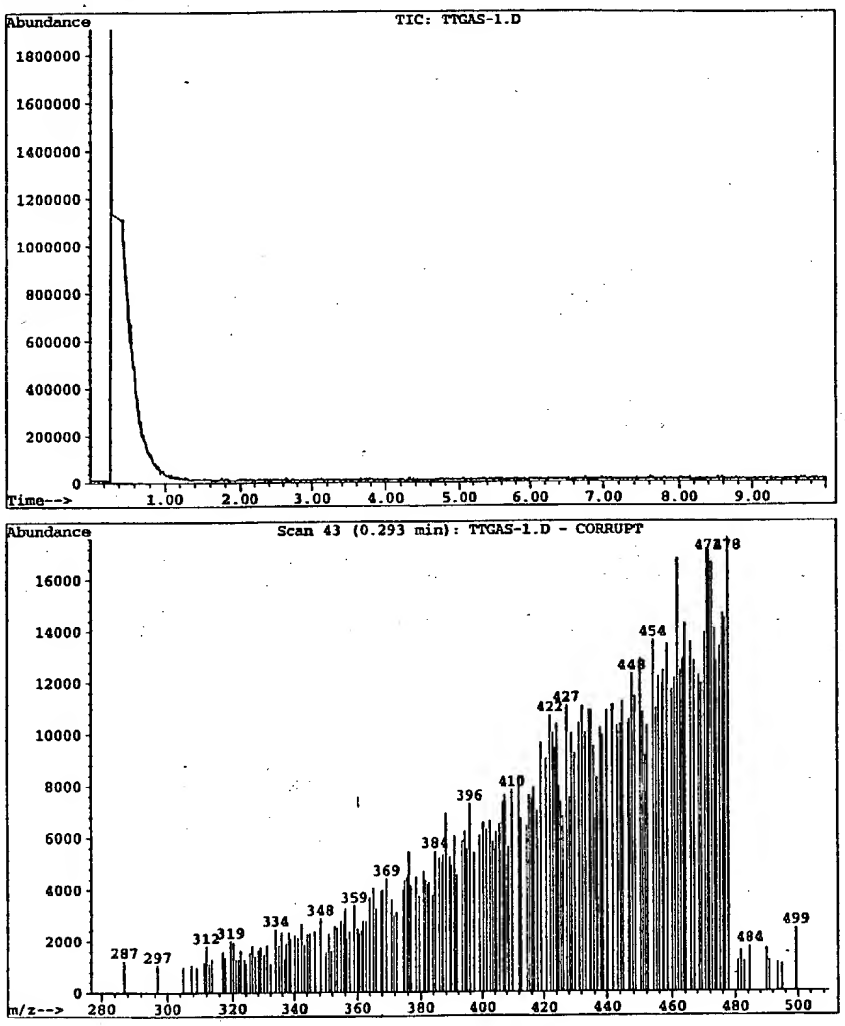


FIGURE 3.9: The first direct experimental verification of Anomaly 3.5 obtained by analyst ***Kevin Lothridge*** at the PCFL on July 25, 1998, on the mutation in time of the magnecules constituting AquaFuel. The MS peak of this figure is macroscopically different than that of Fig. 3.6, despite the fact that they refer to the *same gas* (without even removing the bottle from the feeding line), only scanned 30 minutes apart.

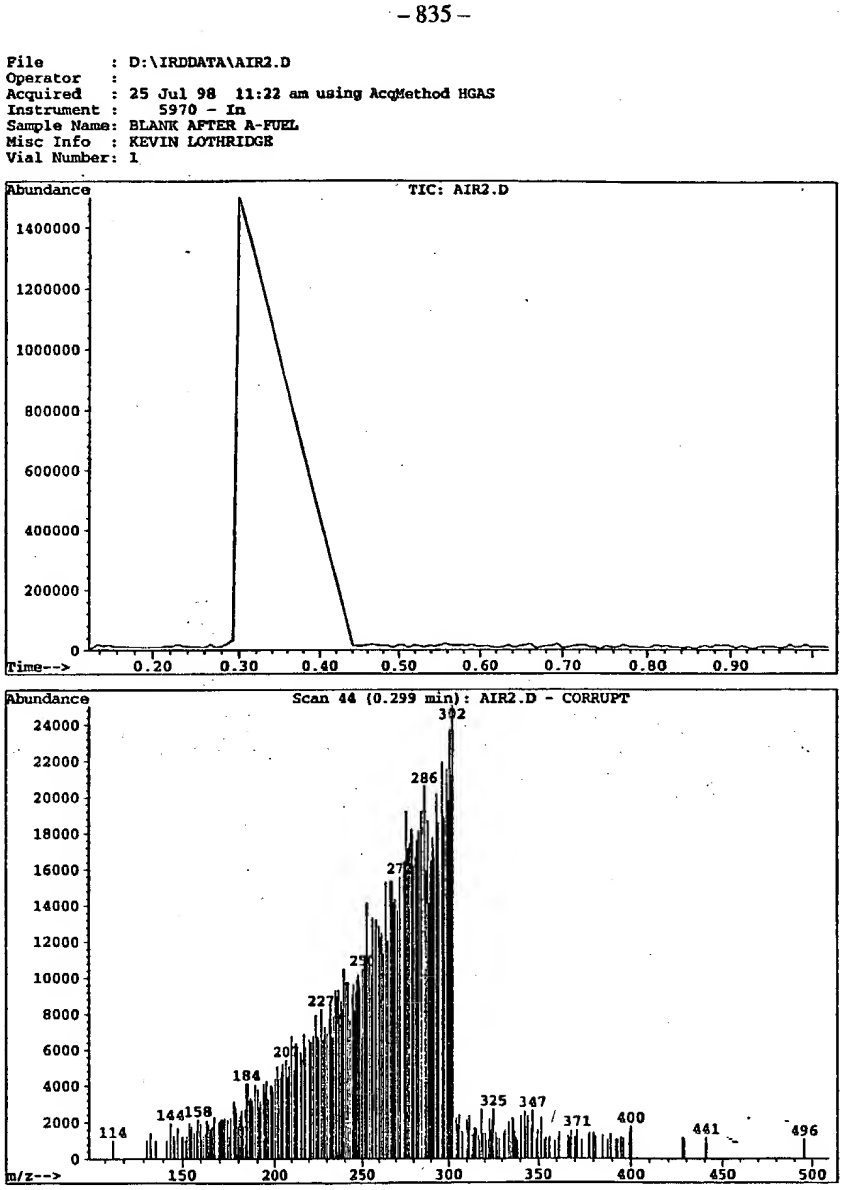


FIGURE 3.10: The first direct experimental verification of Anomaly 3.7 obtained at the PCFL, the increased adhesion of magnecules. The figure reproduces the background of the instrument upon completion of the measurements and removal of AquaFuel. Nevertheless, the background results to be very similar to the MS scan during the tests, thus establishing that part of the gas had remained in the interior of the instrument. This behavior can only

be explained via the induced magnetic polarization of the atoms and molecules in the walls and parts of the instrument with consequential increased adhesion via magnetic bonds. It should be noted that this anomalous adhesion has been confirmed by all subsequent tests for both the gaseous and liquid states.

A third independent verification was conducted on July 29, 1998, by analyst ***David Fries*** at the *CENTER FOR OCEAN TECHNOLOGY* of the *UNIVERSITY OF SOUTH FLORIDA* (USF) in St. Petersburg, under TTL support. The test were done via the use of a GC–MS Barian 2000 in which the GGC had been removed and replaced by a modified Paul's Trap which turned the instrument into a Ion Trap Mass Spectrometer (IT–MS).

Since the equipment belongs to an academic laboratory, it was not equipped with an IRD. This is unfortunate for scientific knowledge because Paul's Trap is based on a locally strong magnetic field which, as such, is expected to polarize all conventional molecules (although in an amount evidently less than the extreme magnetic fields of a large electric discharge).

In fact, the background of the instrument prior to the initiation of measurements showed various peaks which were tentatively identified as conventional molecules. The presence of an IRD would have evidently permitted the separation of science from personal beliefs.

In fact, only the additional presence and use of an IRD would have permitted the scientific identification with only two possibilities: the IR signatures of the peaks in the background are indeed those of the believed conventional molecules; or said peaks have no IR signature at all, in which case they cannot possibly be conventional molecules, because consisting of smaller molecules under the new magnetic bond.

As one can see in the following figure 3.11–3.21 (see Appendix III of Ref. [3f] for the complete documentation), despite the lack of IRD, the measurements provided a third independent verification of *all* preceding experimental evidence on the existence of magnecules.

Moreover, ***the USF measurements established the existence in the AquaFuel magnecules of individual hydrogen atoms, due to the accretion or loss by various peaks of only one hydrogen atom due to variations of only one a.m.u.*** This result was expected because of the known high sensitivity of Paul's Trap. The presence in the AquaFuel magnecules of other individual atoms (such as C or O) is implies in the preceding NTS and PCFL measurements, although it is best established for the case of the hydrogen.

In view of the above occurrence, inspection of the various MS scans

indicates ***the absence in magnecules of systematic numerical periodicities,*** e.g., their systematic increase with periodicity two (sole accretion of H_2 molecules), or thirty-eight (sole accretion of CO molecules).

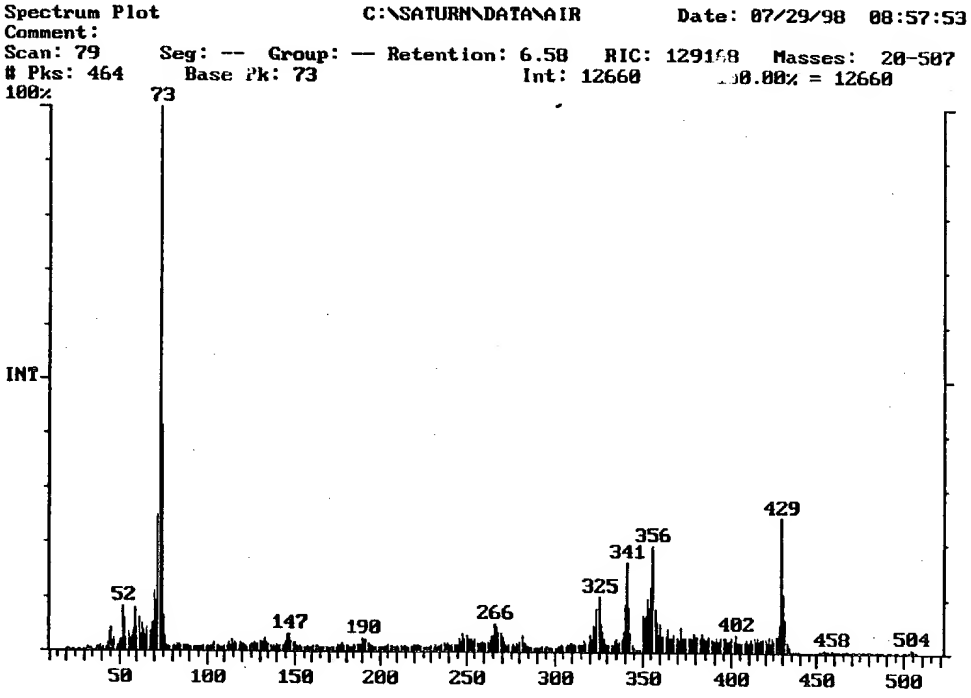


FIGURE 3.11: Scan 79 of the tests conducted on AquaFuel on July 29, 1998, by analyst ***David Fries*** at the *CENTER FOR OCEAN TECHNOLOGIES* of the *UNIVERSITY OF SOUTH FLORIDA* (USF) in St. Petersburg, under support by *TOUPS TECHNOLOGY LICENSING* (TTL) of Largo, Florida. A mere visual inspection of the peaks provides additional direct experimental verifications of Anomaly 3.1 as first established by the NTS data of in Fig. 3.1.

AquaFuel is a *light* gas with about 49% H_2, 40% CO, 9% CO_2, 1% of O_2, and 1% of traces of various heavier substances based on H, O and C individually in ppm. The very existence of the dominant large peak at 73 a.m.u. is unequivocal experimental confirmation of Anomaly 3.1. The large peaks at 246, 325, 341, 356 and 429 a.m.u. then confirm the above evidence beyond credible doubt. Needless to say, there are countless conventional substances having 73 a.m.u., but none of them is possible in a gas composed by H, O and C and created at about about 5,000 C of the electric discharge.

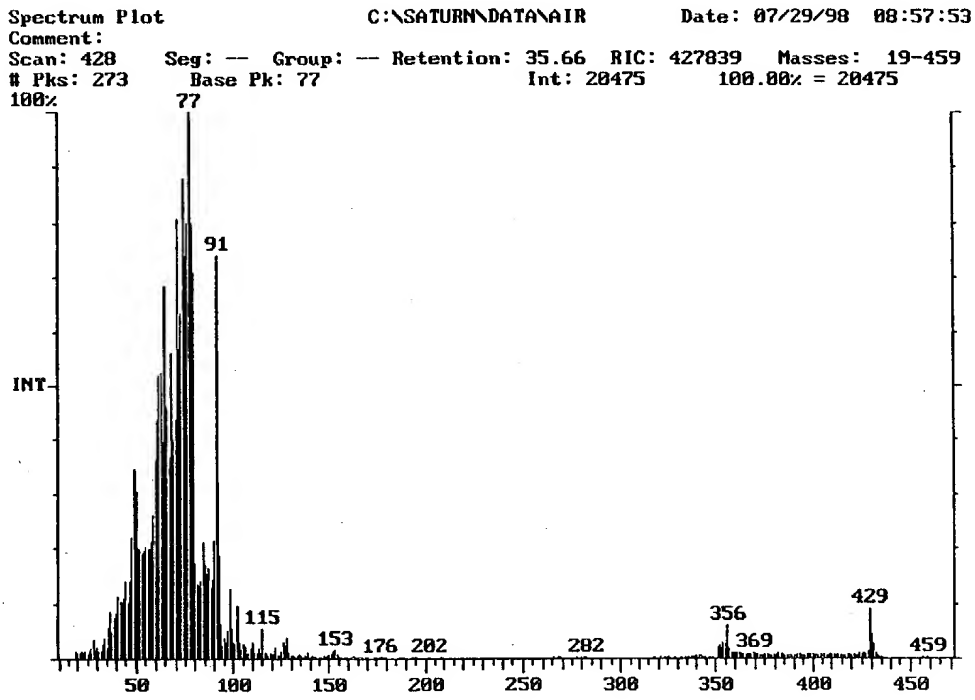


FIGURE 3.12: A reproduction of scan 428 at USF. Note the *dramatic* differences with the preceding scan 79 of Fig. 3.11 which confirm the *mutation the magnecules*. Note also the lack of systematic numerical periodicity in the mutations which are, therefore, at random, as expected from the internal collisions in a gas.

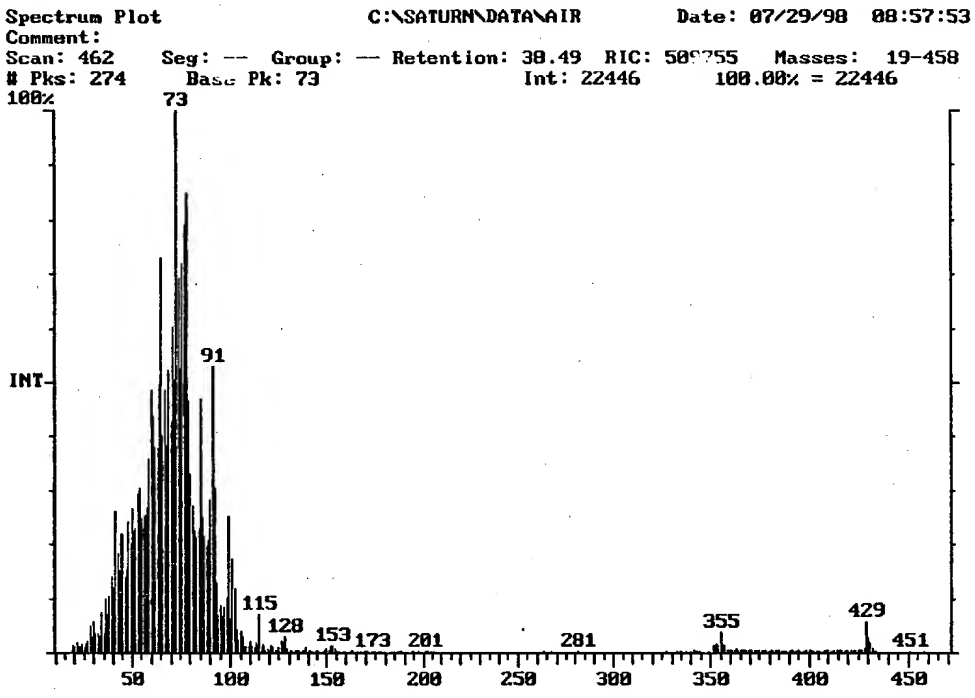


FIGURE 3.13: A reproduction of scan 462 of the USF measurements on AquaFuel which confirms the mutation of magnecules in time. Note the *decrease* of the main peak from 77 a.m.u. of the preceding figure to 73 a.m.u of this figure. Comparison of the two scans also identifies the mutations 202 → 201, 282 → 281, 356 → 355 which provide the ***first***

direct experimental verification of the presence in magnecules of individual hydrogen atoms. Moreover, the mutation of the main peak 77 → 73 provides ***the first experimental evidence of the existence of the elementary magnecule*** $(H_{\uparrow}-H_{\downarrow})\times(H_{\uparrow}-H_{\downarrow})$. In fact, AquaFuel contains helium only in ppm. Mutation 77 → 73 of the dominant peak cannot, therefore, be credibly explained via the loss of a helium atom.

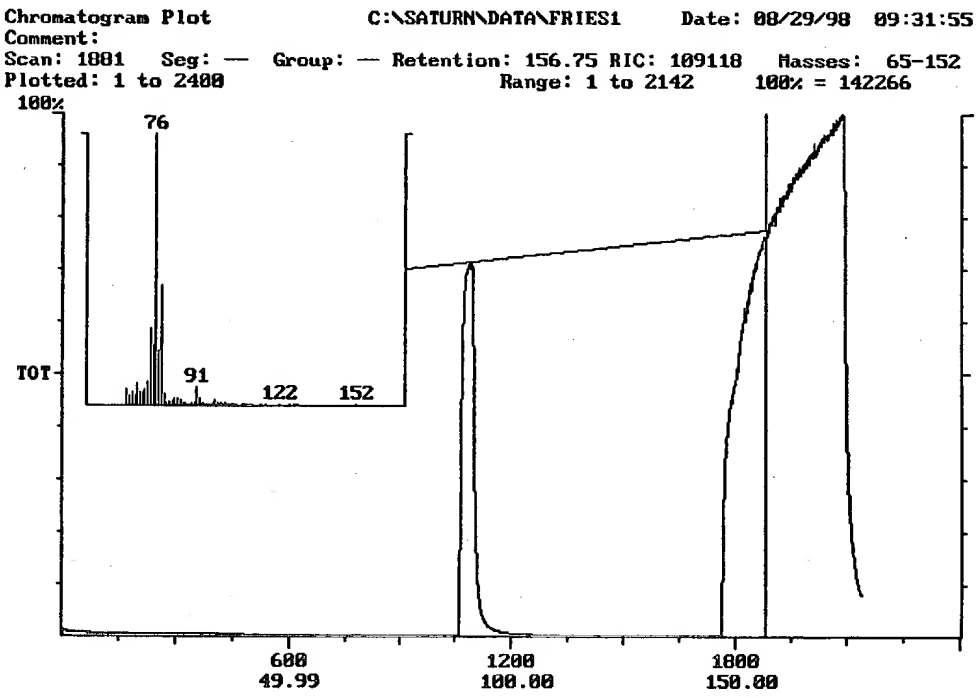


FIGURE 3.14: A reproduction of scan 1881 of the USF measurements on AquaFuel.

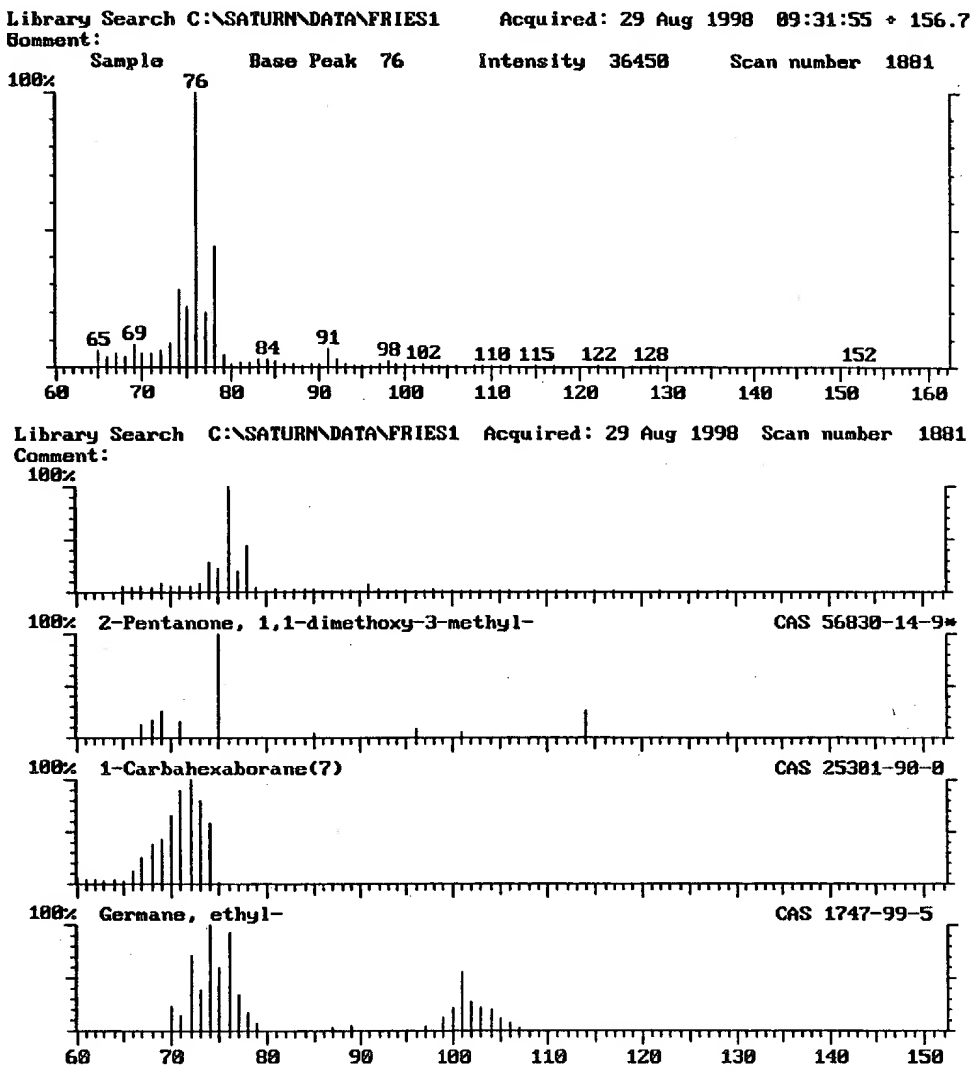


FIGURE 3.15: The lack of identification of the peak of scan 1881. Note that the computer provides 100% confidence on substances that cannot possibly exist in AquaFuel because of the lack of existence in AquaFuel of the necessary elements.

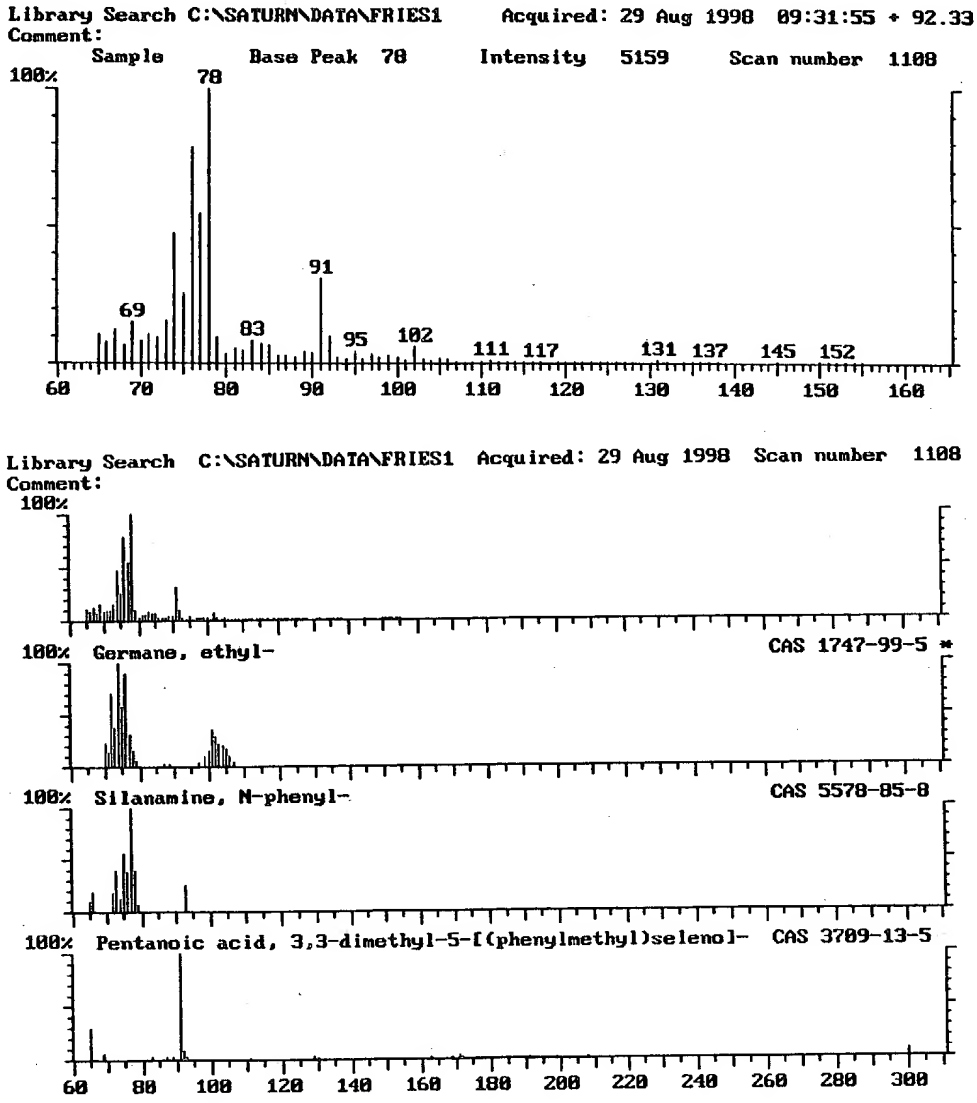


FIGURE 3.16: The lack of identification of the peak in scan 1108.

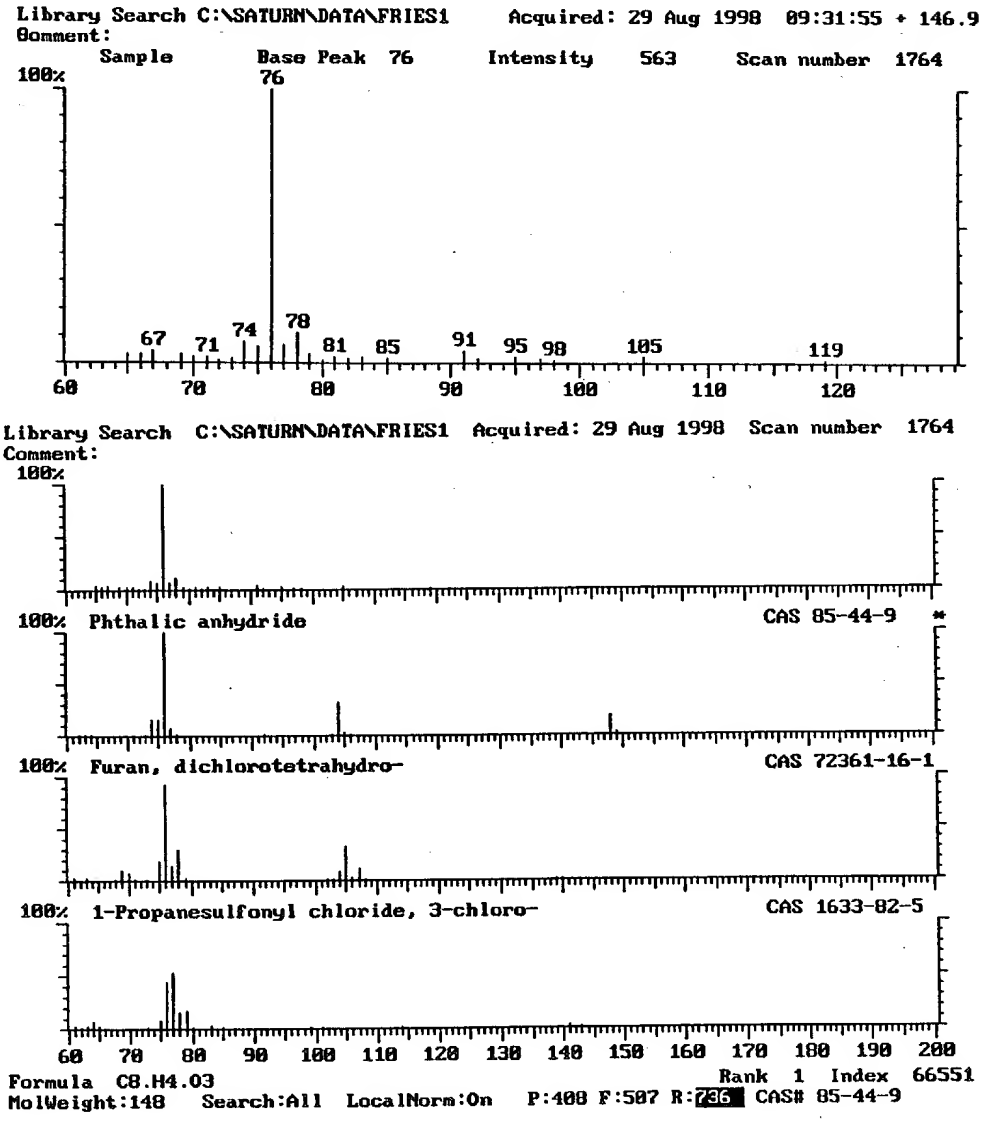


FIGURE 3.17: The lack of identification of the peak in scan 1764.

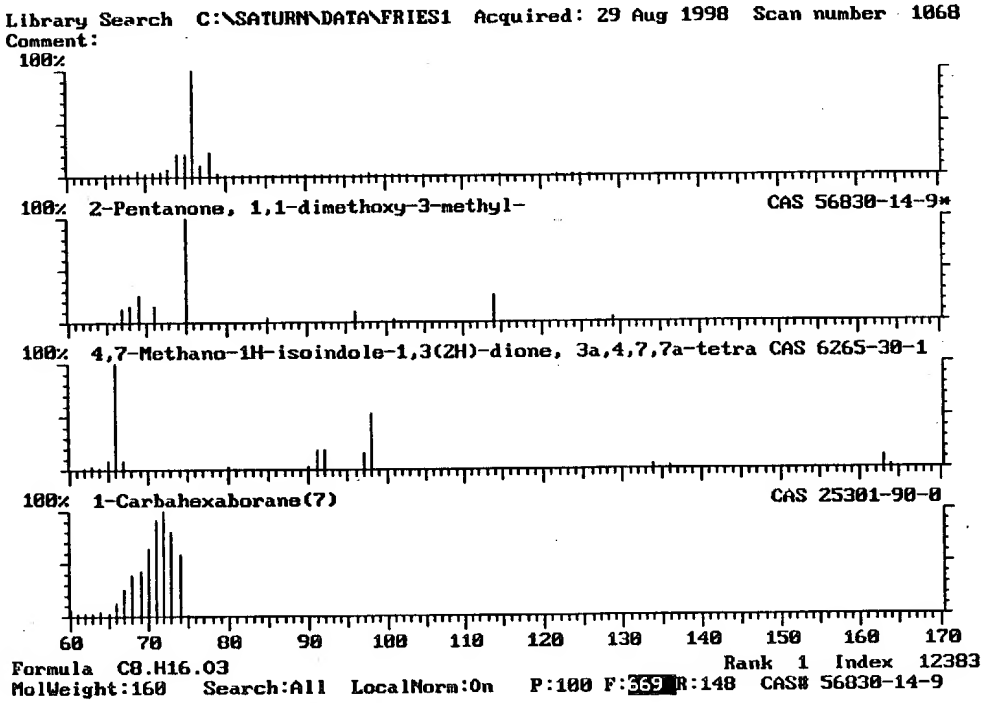


FIGURE 3.18: The lack of identification of the peak in scan 1068.

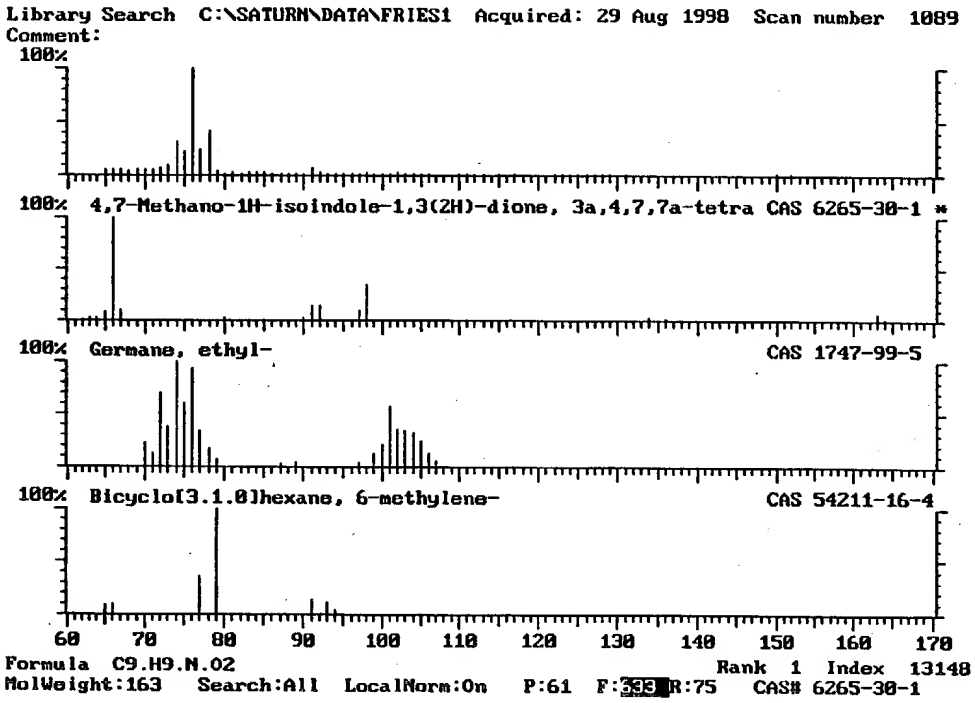


FIGURE 3.19: The lack of identification of the peak in scan 1089.

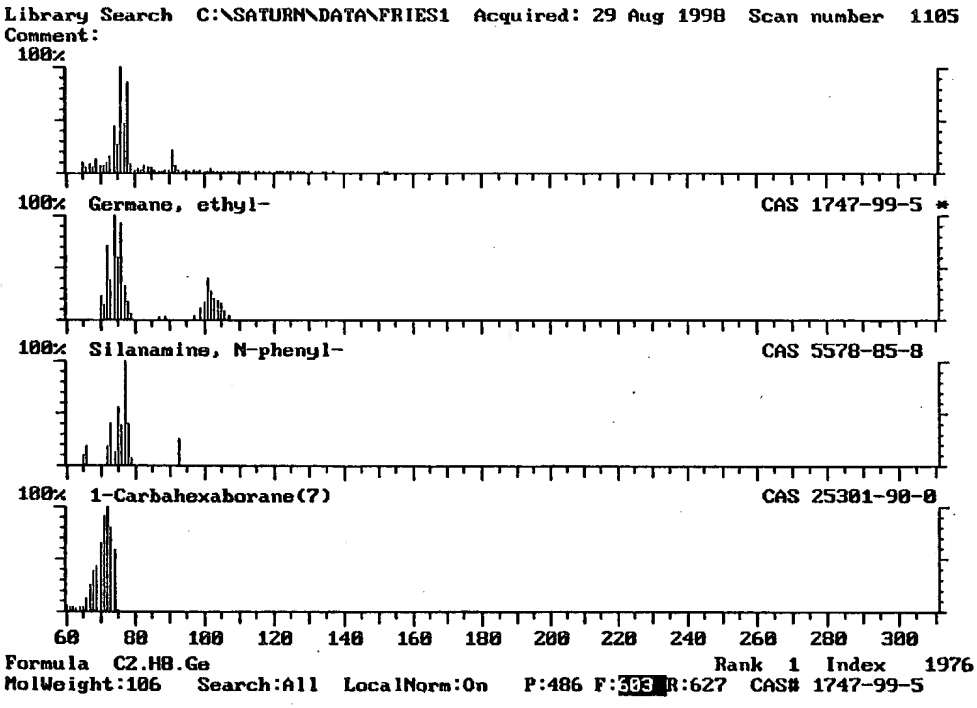


FIGURE 3.20: The lack of identification of the peak in scan 1105.

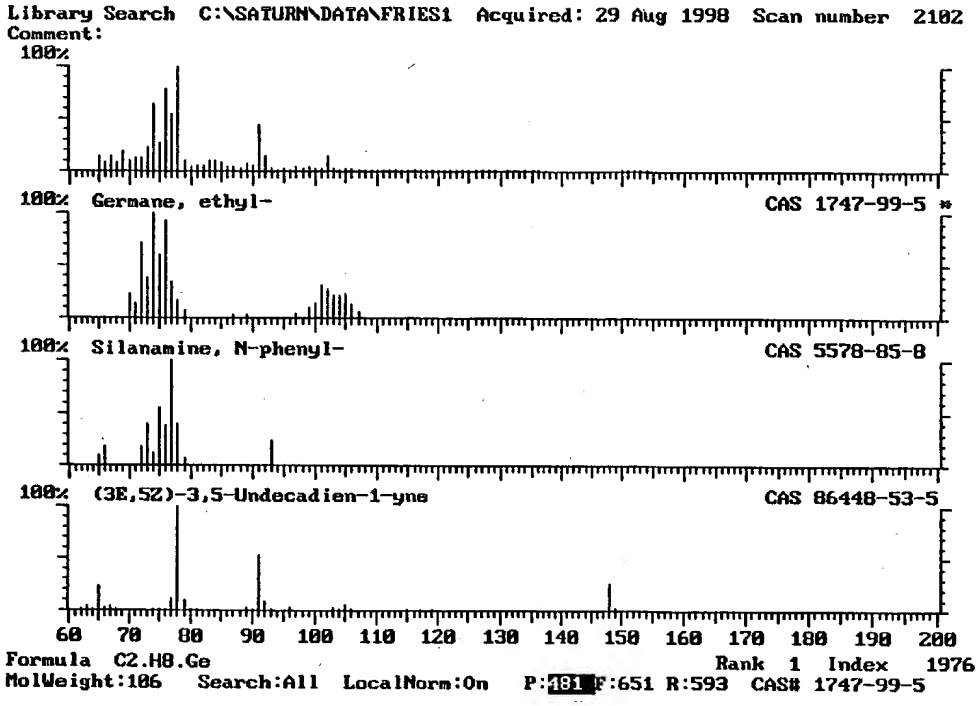


FIGURE 3.21: The lack of identification of the peak in scan 2102.

Experimental evidence on the disappearance of all unknown peaks at sufficiently high temperatures was established for the first time by Dr. ***N. Palibroda*** and Dr. ***P. Glueck*** at the *INSTITUTE FOR ISOTOPIC AND MOLECULAR TECHNOLOGIES* (IIMT) of Cluj-Napoka, Romania, also under TTL support, via a GC-MS MAT 311.

When operated at 150 C, the *same* sample of AquaFuel tested at NTS, PCFL and USF showed no unknown species at all, and only ordinary light gases with ppm of more complex composites of H, O and C. This provided additional support on magnecules as being made-up of ordinary molecules and atoms under a new bond of magnetic origin.

A number of additional experimental confirmation of the above GC-MS/IRD results are under way and they will be reported in future papers.

3.4. Enhanced energy release of magnetically polarized gases. A most scientifically intriguing and industrially significant features of magnetically polarized gases is a dramatic increase in energy released in thermochemical reactions as compared to the same reactions between the same gases in their conventional state.

This remarkable property is established for AquaFuel beyond credible doubt by numerous independent experimental verifications which I briefly outline below (see Web Site [6b] for a comprehensive reports).

As indicated in chemical analysis (3.1), AquaFuel has about 50 % of H_2, 40 % of CO, 9 % of CO_2, 0.2 % of O_2, and 0.,8 % of various composites of H., O and C in ppm.

By recalling that H_2 has 300 BTU/cf, simple ***theoretical calculations*** show that, according to quantum chemistry, AquaFuel should have about 167 BTU/cf, of which 150 BTU/cf are provided by the hydrogen and the remaining BTU's are provided by the remaining components (excluding noncombustible gases such as CO_2). The above theoretical value of energy content was confirmed by *ATLANTIC ANALYTIC LAB* of Whitehouse, New Jersey, *COSA INSTRUMENTS* of Norwood, New Jersey, and other independent laboratories [6b].

However, ***direct experimental tests*** conducted by comparing methane and AquaFuel in running a Coleman Generator powered by a Tecunseh 10 HP two cycles engine (which I have personally eyewitnessed) have established that ***AquaFuel produced from tap water has a minimum of 380 BTU/cf, contrary to the prediction by quantum chemistry that it should have 167 BTU/cf, thus***

resulting in an increase of energy release of 125 % (sic).

Numerous independent tests have not only confirmed the above experimental findings, but actually increased the anomalous release of energy. For instance, tests conducted by *TRI-TECH CORPORATION* (the multinational giant in cutting gases), the branch located in Tampa, Florida, and supervised by Mr. ***Joel D. Rentz,*** VP and Director of local research facilities, have established that ***AquaFuel cuts steel bars as fast and efficiently as acetylene which has 2,300 BTU/cf*** [6b].

This test indicates a loss of efficiency in the comparative burning of AquaFuel and methane in the preceding measurements due to a setting of the Tecunsseh two-cycle engine which is effective for methane, but not sufficient to release all energy content of AquaFuel.

A study of the literature and patents on new combustible gases [7] reveals that the above anomaly is typical of all gases produced under an electric discharge and, therefore, it is inherent in all magnetically polarized gases.

Systematic studies on the origin of this anomaly are under way. I provide below a *conceptual* outline in the hope of stimulating a collegial study of the anomaly due to its evident scientific and industrial significance.

Expected first origin of increased energy release.

According to quantum chemistry, gas molecules in their conventional spherical shape due to rotations are ready for chemical reactions. For instance, in reaction

$$H_2 + O_2 / 2 \rightarrow H_2O + 57 \text{ Kcal / mol}, \qquad (3.3)$$

it is sufficient that the spherically symmetry hydrogen atoms enters in contact with the oxygen atom to activate the exchange and other molecular forces, thus creating the water molecule.

According to hadronic chemistry this is basically not the case. As one can see via a visual inspection of the isochemical model of the hydrogen molecule (Fig. 1.6) and of the water molecule (Fig. 1.7), ***the creation of the water molecule requires the prior elimination of rotational motions.***

It is then evident that ***the magnetic polarization eliminates molecular rotations, thus preparing the atoms in the form needed for bonding with other atoms, with consequential increase of the efficiency of the chemical reaction and resulting higher energy release.***

Preliminary calculations have however indicated that the above origin of the

energy anomaly is insufficient to provide a quantitative explanation of the more than doubling of the energy release.

Expected second origin of increased energy release.

Ordinary molecules have no mutual attractions, again, due to their rotations, while ***magnetically polarized molecules can instead attract each other, thus implying an additional increase in the efficiency of reactions*** such as (3.3).

Despite their plausibility, the above two origins of the energy anomaly are still insufficient to explain how AquaFuel can cut a steel bar as fast and efficient as acetylene.

Expected third origin of increased energy release.

A third plausible origin is suggested by the anomaly of the IR signature of conventional polarized molecules, such as those of Figs. 3.4 and 3.8. In fact, such anomaly implies the presence of ***new internal bonds in conventional molecules, with consequential increase of the binding energy and resulting increase of energy release in esorthermic reactions.***

Note that a 125 % increase of energy release implies the increase of energy released by reaction (3.3) from 57 Kcal/mole to 137 Kcal/mole.

In summary, ***the dramatic increase of energy release by magnetically polarized gases, more than double that of the same unpolarized gases, is the most convincing evidence I have encountered to date on the insufficiencies of quantum chemistry in its most important topic, the molecular structure.***

3.5. The new technology of magnetically polarized gases at Toups Technology Licensing. It is evident that all the above properties imply the birth of the ***new technology of magnetically polarized gases*** which is currently under systematic development and comprehensive patenting at *TOUPS TECHNOLOGY LICENSING* (TTL).

This new technology is based on new means for inducing the polarization of the orbits of (come of) the electrons of conventional gases, and includes comprehensive structural analyses of the gases, as well as measurements of their anomalous physical characteristics and chemical behavior.

As an indication, the *measurement of the number of octanes of AquaFuel as a fuel have* not been possible because readings went over the upper limit of the instrument scale (160 octanes) and no octane measuring equipment is apparently available for over that limit.

This evidence alone is sufficient to establish Anomaly 3.6 on the mutation of

physical characteristics.

Since a number of developments are currently under patenting, I am not at liberty to identify in detail the various aspects and applications of the new technology. I therefore limit myself to the following indications:

More efficient methods of liquefaction of conventional gases. A strong magnetic polarization of any gas is expected to create significant molecular attractions. Less energy for liquefaction is then expected.

Better fuels. The magnetic polarization of any fuel (whether gaseous or liquid) is expected to yield: 1) an increase in energy content as studied in Sect. 3.4; 2) an increase in number of octanes without any chemical manipulation; and 3) a consequential improvement of the combustion exhausts. The automotive implications are evident and so are others, such as the use of k,magnetically polarized hydrogen and oxygen gases in rocket propulsion is expected to permit a significant increase of the payload for the same amount of fuel or its decrease for the same payload.

More efficient fuel cells. As it is well known, current practical applications of fuel cells are limited by their low efficiency. An enhancement of their efficiency is evidently expected from any enhancement of energy release.

I hope to present in some future papers more technical disclosures of the new technology.

4. EXPERIMENTAL EVIDENCE OF MAGNECULES IN LIQUIDS AND SOLIDS AT GIVAUDAN–ROURE CORPORATION

4.1. Creation of magnecules in liquids. The way in which I first created magnecules in liquids is the following.

In early 1998 I obtained a number of samples of fragrance oils thanks to the courtesy of the multinational giant in the perfumes industry, *GIVAUDAN ROURE CORPORATION* (GR) with headquarters in Teaneck, New Jersey, and thanks in particular to: Mr. ***Andrew J. Herskee,*** Senior Vice President; Dr. ***Thomas McGee,*** Senior Vice President for; Mr. ***Kenneth L. Purzycki,*** Director of Fragrance Science; Dr. ***Konrad Lerch,*** Senior Vice President and Director of Corporate Research Laboratories in Dubendorf, Switzerland; and other GR members. The samples were obtained also via the collaboration of Mr. ***Lawrence Perovetz,***

President of *MILLENNIUM CORPORATION* (MC) of Orlando, Florida.

I then placed about 50 cc of various samples of perfectly transparent fragrance oils in individual glass containers and immersed in the oils one polarity of an alnico permanent magnet with 12,000 G and dimension 1/2" × 1" × 2" supplied by *BUNTING MAGNETIC CORPORATION* of Newton, Kansas.

Starting with perfectly clear oils of known viscosity, I observed after a few days a visible darkening of the oils, jointly with a visible increase of the viscosity, changes which evidently varied from oil to oil. Both the darkening and the viscosity increased progressively in subsequent days, to reach in certain cases a dark brown color completely opaqueness to light and an increase in viscosity to such an extent to lose all fluidity.

Following the darkening, in certain samples there was the creation of floating objects which grew in time to such a size to be visible to the naked eye.

I should stress that the above visible effects are of pure magnetic origin because of the lack of any other contribution, e.g., the complete absence of any additives. After the immersion of the permanent magnets, all samples were left open and undisturbed at ordinary room conditions.

The above tests established beyond scientific doubt that the alteration of the characteristics of the oil was of sole magnetic origin, thus excluding all other possible sources.

My main hypothesis on the reason for the darkness of the oils is that their molecules acquire a magnetic polarization of in the orbits of at least some of their electrons (cyclotron resonance orbits), by therefore bonding to each other along lines similar to those for gases.

I should indicate that the samples of fragrance oils were sent from Givaudan–Roure Corporation for novel applications I am not at liberty to disclose at this writing. In this presentation I merely disclose essential scientific aspects.

Moreover, the reader should be aware that immersion of one polarity of a permanent magnet in fragrant oils is, evidently, the most rudimentary possible way to create magnecules and that a number of more sophisticated magnetic polarization techniques are now available with a rather complex geometry which also I am not at liberty of disclosing at this time.

4.2. Photographic evidence of magnecules in liquids. The following Figures 4.1 and 4.2 were taken via an optical microscope by Dr. ***Konrad Lerch,*** Senior Vice President and Director of the GR Corporate Research Laboratories in Dubendorf, Switzerland, and his associates, with the assistance of Mr. ***Lawrence***

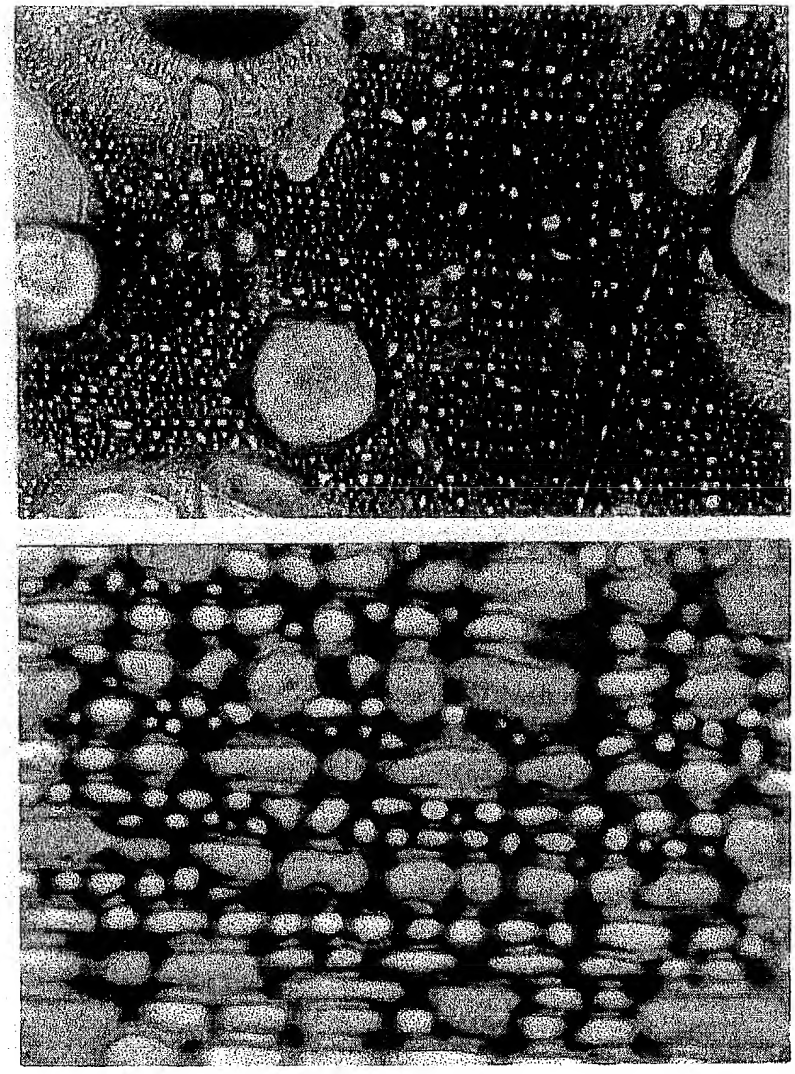


FIGURE 4.1: ***First photographic evidence of magnecules in liquids*** obtained by Dr. ***Konrad Lerch,*** Director of the GR Research Laboratory in Dubendorf, Switzerland, on in the GR fragrance oil "ING258IN Test 2" under magnifications 10X and 100X.

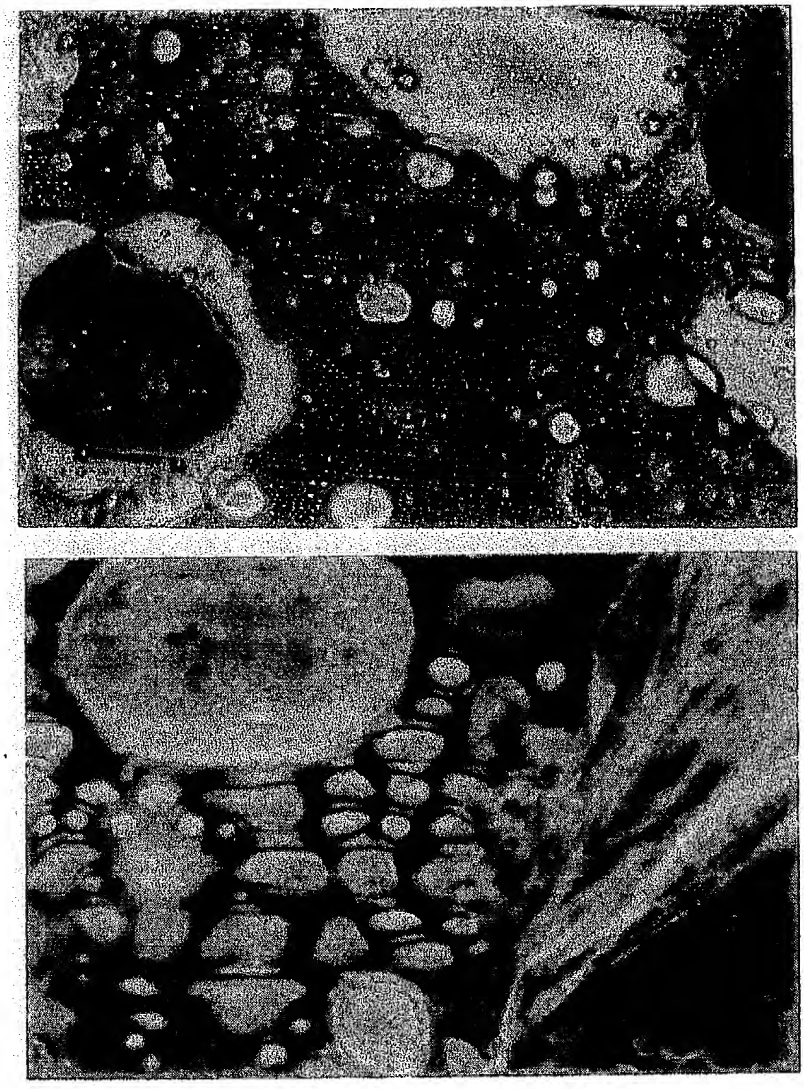


FIGURE 4.2: Additional photographs of magnecules also in "ING258IN Test 2" under magnifications 10X and 100X and also obtained at the GR Research Laboratory in Dubendorf, Switzerland. Note the difference in magnecule sizes with the preceding figure.

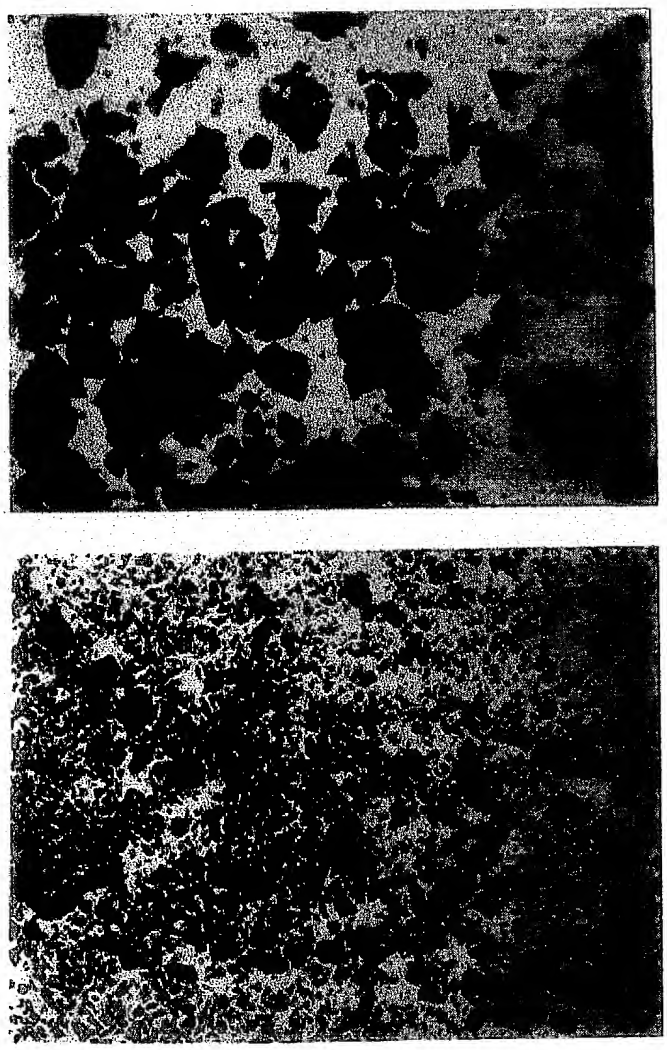


FIGURE 4.3: Confirmation of magnecules in GR fragrance oil "Mixture 2" under 10X and 100X obtained by analyst ***David Fries*** at USF. Note the difference in sizes of the magnecules and their difference with those of Figs. 4.1 and 4.2.

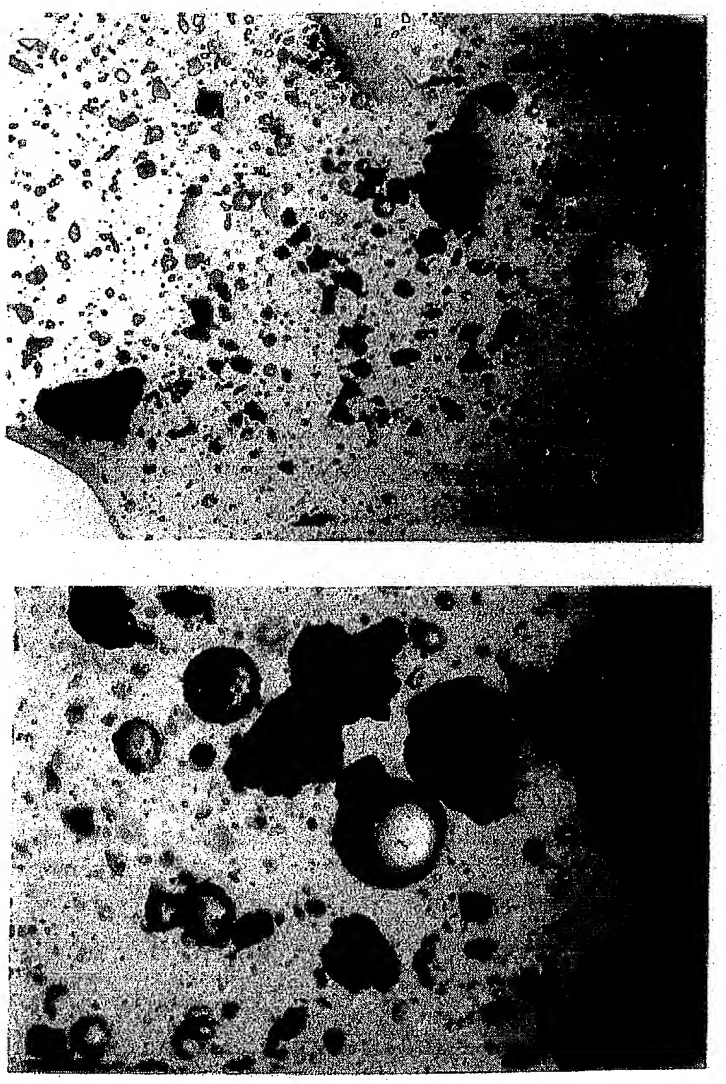


FIGURE 4.4: Additional photographs of magnecules, this time in GR fragrance oil "INX–02349", also obtained by analyst ***David Fries*** at the USF. The visible bubbles are of unknown composition.

Perovetz, MC President.

The pictures refer to the GR fragrance oil received under the code "ING258AIN, Text 2" subjected to the rudimentary magnetic polarization indicated in the preceding section under the respective magnification 10X and 100X

As one can see, these photographs establish that, under the indicated magnetic treatment, the oil has acquired a structure of the type of "brick layering" which is visible under only 10X magnification (top of Figs. 4.1 and 4.2), which is per se highly anomalous for a liquid that was originally fully transparent. The magnecules are constituted by the individual "bricks" shown in the 100X magnification (bottom of the figures).

Inspection of the various photograph shows a variety of sizes of magnecules, thus establishing their lack of unique characteristics for any given oil. This evidently confirms the *lack* of a valence bond (evidently because the latter would imply a fixed maximal size). The photographs also show the magnecules capability for accretion, that is, the capability of increasing their size via the addition of further oil molecules.

The photographs in Figures 4.3 and 4.4 were taken by analyst ***David Fries*** of the *CENTER FOR OCEAN TECHNOLOGY* of the *UNIVERSITY OF SOUTH FLORIDA* (USF) in St. Petersburg, thanks to financial support by *TOUPS TECHNOLOGY LICENSING* (TTL) of Largo, Florida.

These additional photographs are for the same magnifications 10X and 100X, but refer to different GR fragrance oils. Fig. 4.3 depicts the GR oil "Mixture 2" magnetically treated to such a point to completely lose transparence and fluidity while Fig. 4.4 depicting GR oil "INX–01349" with a visible change in color and increase in viscosity.

As one can see, the latter picture provide incontrovertible confirmation that, following exposure to a 12,000 G magnetic field, fragrance oil molecule bond together into rather large clusters estimated to be well in excess of 10,000 a.m.u., thus confirming Anomaly 3.1 for liquids.

Other photographic documentations of various magnecules in liquids are available confirming the above findings. They are not reproduced here for brevity.

4.3. Spectroscopic evidence of magnecules in liquids. The first experimental evidence on magneclusters in liquids was established on May 5, 1998, by analysts ***Brian Wallace*** and ***Mia Burnett*** at *TEKMAR–DOHRMANN CORPORATION* (TDC) in Cincinnati, Ohio, by operating a Tekmar 7000 HT Static Headspacer Autosampler equipped with a Flame Ionization Detector (FID). The tests were repeated on May 8 and 11, 1998, by confirming the preceding results. The

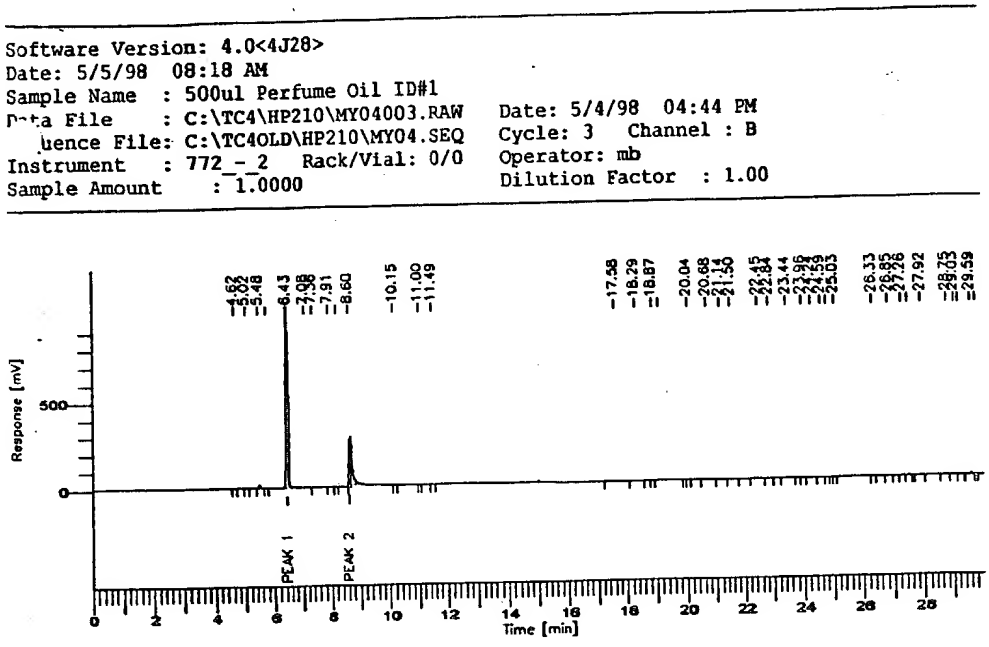
tests were done with the assistance of Mr. *Lawrence Perovetz*, MC President.

The measurements were done on: Sample 1, pure (magnetically untreated) GR "Fragrance Oil 2"; Sample 2, magnetically utreated tap water; and Sample 3, a magnetically treated mixture of the two.

It should be noted that the Tekmar equipment lacks the computer search as well as the UV scan. Also, recall that magnecules in a *light gas* can have molecular weight all the way to 1,000 a.m.u. and more, as established in AquaFuel.

It then follows that magnecules in *liquids* can have much bigger molecular weight all the way to 10,000 amu and more, thus requiring instruments cryogenically operated and kept at room temperature, equipped with extra large feeding lines, and capable to scan all the way to very high molecular weights. The latter features were absent in the considered Tekmar instrument.

Despite that, the results of the Tekmar tests constitute ***the first direct spectroscopic experimental evidence of the existence of magnecules in liquids,*** including ***the first direct experimental evidence of water magneplexes*** as per Definition 2.1 (see the complete documentation in Appendix IV of Ref. [3f]).



DEFAULT REPORT

Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		4.620	2106.00	0.01
2		5.022	432.00	0.00
3		5.479	68060.38	0.43
4		5.731	1120.12	0.01
5	peak 1	6.430	3894142.72	24.38
6		7.077	23106.00	0.14
7		7.355	8426.66	0.05
8		7.911	1549.62	0.01
9		8.163	190.00	0.00
10	peak 2	8.604	509716.00	3.19
11		10.146	829.00	0.01
12		10.999	338.00	0.00
13		11.485	798.00	0.00
14		17.582	9646.00	0.06
15		18.294	814.50	0.01
16		18.871	748.51	0.00
17		19.082	12390.99	0.08
18		20.043	582.50	0.00
19		20.679	4000.46	0.03
20		21.139	654.15	0.00
21		21.500	716.38	0.00
22		22.452	4196.12	0.03
23		22.837	1128.88	0.01
24		23.437	10546.00	0.07
25		23.958	1292.73	0.01
		24.241	5968.77	0.04
		24.587	980.85	0.01
		24.764	700.15	0.00
29		25.034	221.00	0.00
30		26.330	189.00	0.00
31		26.849	7912.00	0.05
32		27.264	19913.14	0.12
33		27.461	10844.36	0.07
34		27.918	1332.00	0.01
35		28.133	751.69	0.00
		29.026	3094.14	0.02
		29.163	2312.68	0.01
		29.589	30846.00	0.19
39		29.750	383.00	0.00
40		30.320	6254.00	0.04
41		31.370	3617.37	0.02
42		31.720	51605.63	0.32
43		32.296	268.00	0.00
44		32.519	87913.29	0.55
45	Peak 3	32.742	11181133.21	70.00
			15973772.00	100.00

FIGURE 4.5: A reproduction of one of the scab conducted on May 5, 1998, at 8.18 a.m., by analysts ***Brian Wallace*** and ***Mia Burnett*** at *TEKMAR-DOHRMANN CORPORATION* (TDC) in Cincinnati, Ohio, by operating a Tekmar 7000 HT Static Headspacer Autosampler equipped with a Flame Ionmization Detector (FID). The scan is for a sample of magnetically untreated GR fragrance oil received under the label of "Mixture 2" which results to be composed by three primary molecular constituents with: Peak 1 at 6.430 min and 24.28 %; Peak 2 at 8.604 min and 3.19 %; and Peak 3 at 37.742 and 70.00 % (off scan scale), totaling 97.57 %. This provides the chemical structure of the fragrance oil in Fig. 4.3.

```
oftware Version: 4.0<4J28>
ate: 5/5/98  08:20 AM
ample Name   : 500ul H2O ID#2
ata File     : C:\TC4\HP210\MY04005.RAW   Date: 5/4/98  06:06 PM
  uence File: C:\TC4OLD\HP210\MY04.SEQ    Cycle: 5   Channel : B
strument     : 772_-_2   Rack/Vial: 0/0   Operator: mb
ample Amount     : 1.0000                 Dilution Factor  : 1.00
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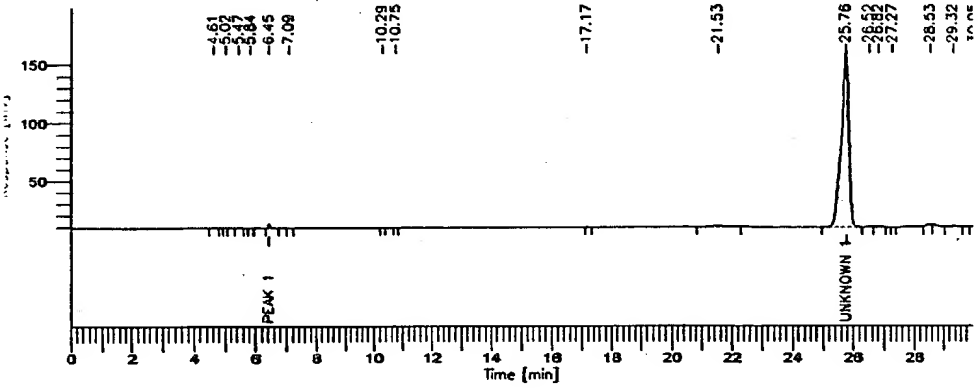
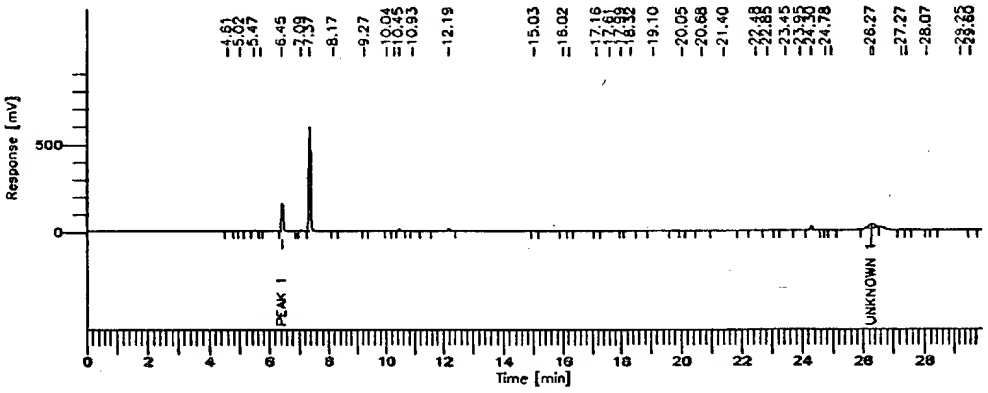


DEFAULT REPORT

Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		4.614	2904.00	0.07
2		5.024	375.50	0.01
3		5.469	1328.00	0.03
4		5.844	322.00	0.01
5	peak 1	6.446	17310.50	0.43
6		7.088	390.00	0.01
7		10.288	164.00	0.00
8		10.746	189.00	0.00
9		17.171	970.50	0.02
10		21.527	32334.00	0.81
11	unknown 1	25.763	2565644.21	64.24
12		26.522	2794.13	0.07
13		26.821	3354.66	0.08
14		27.271	184.00	0.00
15		28.534	3914.50	0.10
16		29.315	9941.00	0.25
17		30.048	1062.00	0.03
18		30.981	1916.00	0.05
19	unknown 2	31.653	1319095.00	33.53
20	Peak 3	32.680	9951.00	0.25
			3994144.00	100.00

FIGURE 4.6: The ***first spectroscopic experimental evidence of magneplexes in magnetically treated tap water,*** achieved on May 5, 1998, at 8.20 a.m. by analyst ***Mia Burnett*** and her associates at TDC. The magneplexes are characterized by the large "unknown" peak at 25.763 min for 64.24 % identifying an anomalous water clustering

Software Version: 4.0<4J28>
Date: 5/5/98 08:21 AM
Sample Name : 500ul Oil&H2O ID#3
Data File : C:\TC4\HP210\MY04009.RAW Date: 5/4/98 08:50 PM
Sequence File: C:\TC4OLD\HP210\MY04.SEQ Cycle: 9 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



DEFAULT REPORT

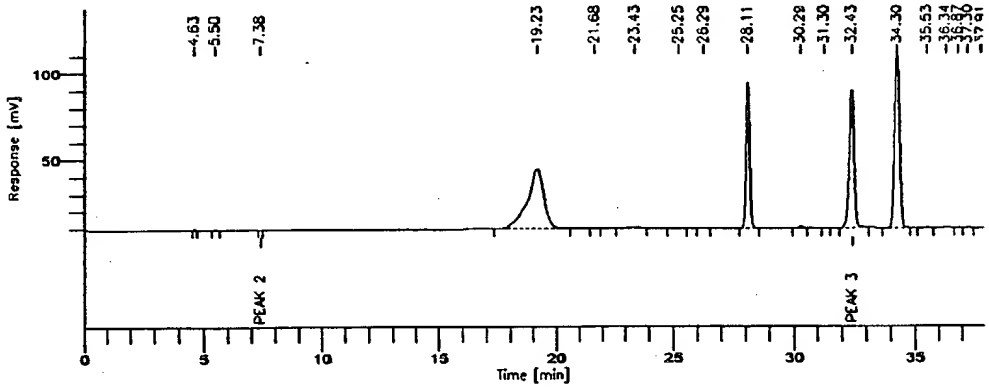
Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		4.612	2960.00	0.02
2		5.021	482.50	0.00
3		5.466	14446.00	0.11
4		5.716	302.00	0.00
5	peak 1	6.449	700997.00	5.33
6		7.085	17702.00	0.13
7		7.373	2463631.95	18.74
8		8.174	1041.55	0.01
9		9.273	398.50	0.00
10		10.038	693.50	0.01
11		10.287	407.59	0.00
12		10.454	32776.91	0.25
13		10.932	455.00	0.00
14		12.185	45046.00	0.34
15		15.029	735.50	0.01
16		16.018	363.50	0.00
17		16.215	289.50	0.00
18		17.163	405.10	0.00
19		17.607	8138.75	0.06
20		17.989	258.64	0.00
21		18.323	773.50	0.01
22		19.101	7936.00	0.06
23		20.050	1513.00	0.01
24		20.684	3329.49	0.03
25		21.403	6640.01	0.05
--		22.477	3417.00	0.03
		22.848	1399.00	0.01
		23.453	8746.50	0.07
29		23.945	5373.77	0.04
30		24.296	89748.23	0.68
31		24.777	1228.40	0.01
32		24.966	2011.60	0.02
33	unknown 1	26.272	229566.61	1.75
34		26.347	152811.39	1.16

Result File : ~RST105F.RST, Printed On 5/5/98 08:21 AM page 2

Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
35		27.273	23098.00	0.18
		27.410	13015.00	0.10
		28.070	324.00	0.00
--		29.254	52774.58	0.40
39		29.599	19904.00	0.15
40		30.345	65596.75	0.50
41		30.880	2408.67	0.02
42		31.387	6170.93	0.05
43	unknown 2	31.491	59456.07	0.45
44		32.089	664.00	0.01
45		32.528	64277.94	0.49
46	Peak 3	32.758	9034646.06	68.71
			13148362.00	100.00

FIGURE 4.7: The ***first spectroscopic experimental evidence of magnecules in liquids*** achieved on May 5, 1998, at 8.21 a.m., by analysts ***Brian Wallace*** and ***Mia Burnett*** at TDC, on a magnetically treated combination of GR "Mixture 2" and tap water. Note the primary constituents: a first peak at 6.449 for 5.33 %; a second peak at 7.373 min for 18.74 %; a third peak listed by the equipment as "unknown 1" at 26.272 min for 1.75 %; a fourth peak at 26.347 for 1.16%; a fifth peak listed by the equipment as "unknown 2" at 31.491 for 0.45 %; and a sixth peak at 32.758 min for 68.71 %; totaling 96.14 %. Comparison of these data with those on the untreated oil as well as untreated water establish numerous macroscopic alterations (mutations) of chemical constituents, their ramp time and their percentages which can only be interpreted as due to magnecules.

Software Version: 4.0<4J28>
Date: 5/5/98 02:06 PM
Sample Name : Blank
Data File : C:\TC4\HP210\MY05001.RAW Date: 5/5/98 09:08 AM
Sequence File: C:\TC4OLD\HP210\MY05.SEQ Cycle: 1 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00

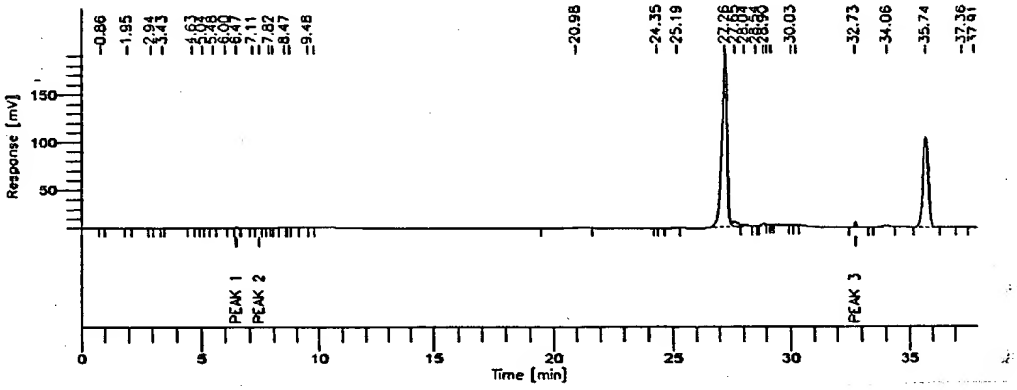


DEFAULT REPORT

Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		4.633	2621.00	0.05
2		5.496	695.50	0.01
3	peak 2	7.379	293.00	0.01
4		19.227	1795761.00	33.57
5		21.679	1071.00	0.02
6		23.432	18393.00	0.34
7		25.247	6824.50	0.13
8		26.290	2393.00	0.04
9		28.110	835986.00	15.63
10		30.291	12877.00	0.24
11		31.296	1435.00	0.03
12	Peak 3	32.425	1135236.50	21.22
13		34.296	1508602.50	28.20
14		35.532	6202.50	0.12
15		36.344	9033.76	0.17
16		36.866	1934.19	0.04
17		37.297	7005.45	0.13
18		37.914	2731.10	0.05
			5349096.00	100.00

FIGURE 4.8: The ***first spectroscopic experimental evidence of anomalous adhesion of magnetically treated liquids*** achieved on May 5, 1998, at 2.06 p.m., by analysts ***Brian Wallace*** and ***Mia Burnett*** and her associates a TDC, depicting a background following the tests similar to the tests themselves, including new "unknowns". It should be noted that, at the time of the tests, the analysts were unaware of the anomaly.

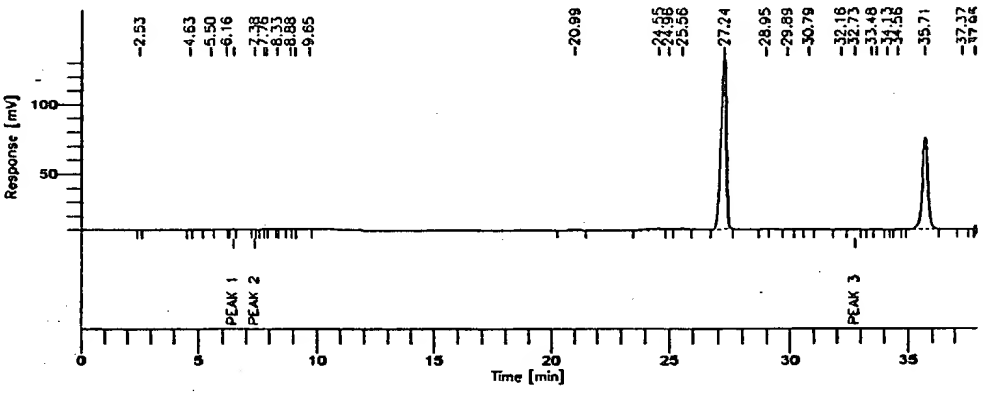
Software Version: 4.0<4J28>
Date: 5/5/98 02:08 PM
Sample Name : ID#2 H2O
Data File : C:\TC4\HP210\MY05006.RAW Date: 5/5/98 12:53 PM
Sequence File: C:\TC4OLD\HP210\MY05.SEQ Cycle: 6 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		0.863	336.50	0.01
2		1.945	352.50	0.01
3		2.935	260.00	0.01
4		3.431	138.00	0.00
5		4.627	6093.50	0.14
6		5.039	267.00	0.01
7		5.483	1176.05	0.03
8		6.000	614.95	0.01
9	peak 1	6.472	10192.00	0.23
10		7.110	531.26	0.01
11	peak 2	7.401	1525.24	0.03
12		7.819	240.00	0.01
13		7.952	113.00	0.00
14		8.465	600.50	0.01
15		8.656	221.00	0.00
16		9.481	548.00	0.01
17		9.758	562.00	0.01
18		20.976	30735.50	0.69
19		24.346	263.00	0.01
20		25.192	1078.00	0.02
21		27.258	2656625.73	59.56
22		27.649	89561.00	2.01
23		28.040	43010.33	0.96
24		28.544	2008.94	0.05
25		28.897	20488.43	0.46
26		29.049	3501.57	0.08
27		29.202	1250.00	0.03
28		30.032	1068.56	0.02
29		30.228	2652.44	0.06
30	Peak 3	32.732	34944.00	0.78
31		34.063	37651.00	0.84
32		35.738	1505974.50	33.76
33		37.364	3314.42	0.07
34		37.912	2763.58	0.06

FIGURE 4.9: The subsequent print-out of the TDC tests at 2.08 p.m. on the magnetically treated water. Note the visible difference with the test of Fig. 4.6 due to the anomalous adhesion of oil molecules which remained in the instrument.

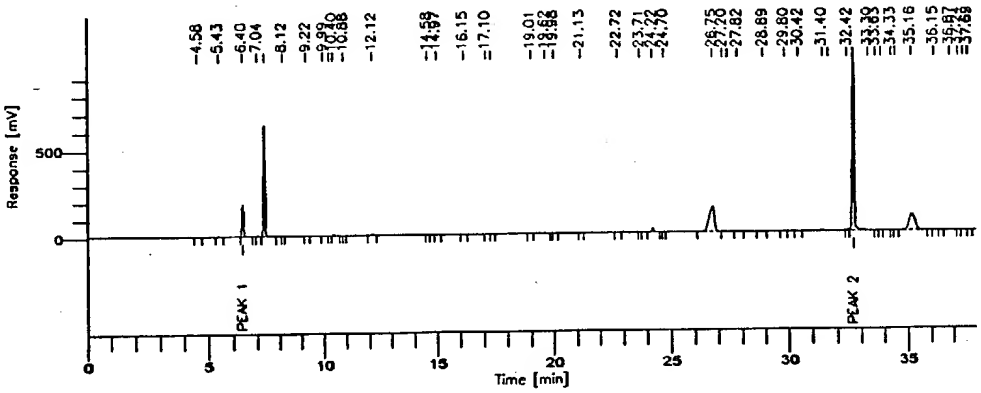
Software Version: 4.0<4J28>
Date: 5/5/98 02:08 PM
Sample Name : Blank
Data File : C:\TC4\HP210\MY05005.RAW Date: 5/5/98 12:08 PM
Sequence File: C:\TC4OLD\HP210\MY05.SEQ Cycle: 5 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		2.531	220.50	0.01
2		4.630	2765.00	0.09
3		5.497	880.34	0.03
4		6.163	532.66	0.02
5	peak 1	6.451	1531.00	0.05
6	peak 2	7.384	392.00	0.01
7		7.764	293.00	0.01
8		7.877	217.00	0.01
9		8.331	164.50	0.01
10		8.883	359.00	0.01
11		9.077	255.38	0.01
12		9.646	1118.62	0.04
13		20.988	13301.50	0.45
14		24.547	38775.96	1.31
15		24.956	4804.04	0.16
16		25.558	19220.00	0.65
17		27.244	1776561.00	60.11
18		28.947	4845.00	0.16
19		29.892	1725.00	0.06
20		30.786	1475.00	0.05
21		32.163	2189.31	0.07
22	Peak 3	32.731	6240.69	0.21
23		33.483	2329.61	0.08
24		33.671	3667.39	0.12
25		34.127	221.00	0.01
26		34.558	900.00	0.03
27		35.714	1063544.50	35.99
28		37.367	2864.00	0.10
29		37.953	3895.00	0.13
			2955288.00	100.00

FIGURE 4.10: The subsequent print-out of the TDC tests at 2.08 p.m. on the background which confirms the anomalous adhesion of magnecules.

Software Version: 4.0<4J28>
Date: 5/8/98 12:21 PM
Sample Name : Mixture bottom H2O layer 500ul
Data File : C:\TC4\HP210\MY08004.RAW Date: 5/8/98 11:32 AM
Sequence File: C:\TC4\HP210\MY08.SEQ Cycle: 4 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



DEFAULT REPORT

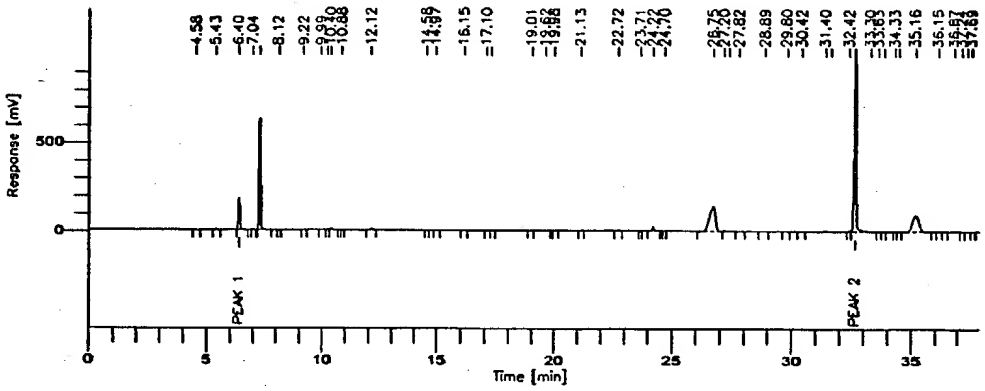
Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		4.583	3494.00	0.03
2		5.431	16223.50	0.12
3	peak 1	6.404	792172.00	5.94
4		7.039	16982.00	0.13
5		7.325	2550078.00	19.12
6		8.124	630.00	0.00
7		9.220	415.00	0.00
8		9.985	627.00	0.00
9		10.230	309.00	0.00
10		10.398	30885.50	0.23
11		10.877	298.50	0.00
12		12.123	39988.00	0.30
13		14.575	241.00	0.00
14		14.967	986.50	0.01
15		16.152	365.00	0.00
16		17.103	2121.00	0.02
17		17.308	924.00	0.01
18		19.011	267.50	0.00
19		19.619	4481.50	0.03
20		19.981	428.00	0.00
21		21.133	2269.00	0.02
22		22.716	613.00	0.00
23		23.708	214.00	0.00
24		24.220	81808.50	0.61
25		24.704	168.50	0.00
26		26.751	2431379.65	18.23
27		27.197	8519.35	0.06
28		27.396	589.00	0.00
29		27.819	405.00	0.00
30		28.890	2294.00	0.02
31		29.804	752.00	0.01
32		30.417	607.50	0.00
33		31.395	21039.50	0.16
34		31.648	1279.00	0.01

Result File : MY08004.RST, Printed On 5/8/98 12:21 PM page 2

Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
35		32.420	30869.65	0.23
36	peak 2	32.650	5704719.54	42.77
37		33.298	22792.00	0.17
38		33.629	4363.61	0.03
39		33.849	2192.20	0.02
40		34.329	146.22	0.00
41		34.476	841.46	0.01
42		35.160	1547684.32	11.60
43		36.148	1621.00	0.01
44		36.868	2830.75	0.02
45		37.244	577.25	0.00
46		37.506	3180.55	0.02
47		37.691	1038.45	0.01
			13336712.00	100.00

FIGURE 4.11: The ***first spectroscopic experimental evidence of the mutation of magnecules in liquids*** achieved on May 8, 1998, at 12.21 p.m., by analysts ***Brian Wallace*** and ***Mia Burnett*** and her associates at TDC. The scan deals with the magnetically treated combination of GR fragrance oil "mixture 2" and tap water with: a first peak at 6.404 min for 5.94 %; a second peak at 7.325 min for 19.12 %; a third peak at 26.751 min for 18.23 %; a fourth peak at 32.650 min for 42.77 %; and a fifth peak at 35.160 min for 11.60 %; totaling 97.66 %. The mutation is established by the comparison of this scan with the preceding ones.

Software Version: 4.0<4J28>
Date: 5/11/98 08:07 AM
Sample Name : Mixture bottom H2O layer 500ul
Data File : C:\TC4\HP210\MY08004.RAW Date: 5/8/98 11:32 AM
Sequence File: C:\TC4\HP210\MY08.SEQ Cycle: 4 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



DEFAULT REPORT

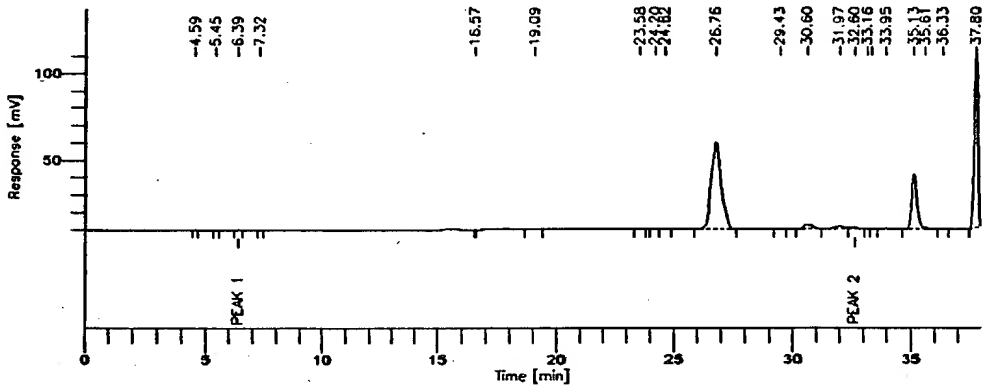
Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		4.593	3494.00	0.03
2		5.431	16223.50	0.12
3	peak 1	6.404	792172.00	5.94
4		7.039	16982.00	0.13
5		7.325	2550078.00	19.12
6		8.124	630.00	0.00
7		9.220	415.00	0.00
8		9.985	627.00	0.00
9		10.230	309.00	0.00
10		10.398	30885.50	0.23
11		10.877	298.50	0.00
12		12.123	39988.00	0.30
13		14.575	241.00	0.00
14		14.967	986.50	0.01
15		16.152	365.00	0.00
16		17.103	2121.00	0.02
17		17.308	924.00	0.01
18		19.011	267.50	0.00
19		19.619	4481.50	0.03
20		19.981	428.00	0.00
21		21.133	2269.00	0.02
22		22.716	613.00	0.00
23		23.708	214.00	0.00
24		24.220	81808.50	0.61
25		24.704	168.50	0.00
26		26.751	2431379.65	18.23
27		27.197	8519.35	0.06
28		27.396	589.00	0.00
29		27.819	405.00	0.00
30		28.890	2294.00	0.02
31		29.804	752.00	0.01
32		30.417	607.50	0.00
33		31.395	21039.50	0.16
34		31.648	1279.00	0.01

Result File : ~RST2255.RST, Printed On 5/11/98 08:07 AM page 2

Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
35		32.420	30869.65	0.23
36	peak 2	32.650	5704719.54	42.77
37		33.298	22792.00	0.17
38		33.629	4363.61	0.03
39		33.849	2192.20	0.02
40		34.329	146.22	0.00
41		34.476	841.46	0.01
42		35.160	1547684.32	11.60
43		36.148	1621.00	0.01
44		36.868	2830.75	0.02
45		37.244	577.25	0.00
46		37.506	3180.55	0.02
47		37.691	1038.45	0.01
			13336712.00	100.00

FIGURE 4.12: A print-out of the TDC tests on May 11, 1998, at 8.07 a.m. on the magnetically treated combination of GR "Mixture 2" and tap water. Comparison with the preceding scans provides additional confirmation of the mutation of magnecules.

Software Version: 4.0<4J28>
Date: 5/11/98 08:08 AM
Sample Name : Blank
Data File : C:\TC4\HP210\MY08006.RAW Date: 5/8/98 01:02 PM
Sequence File: C:\TC4\HP210\MY08.SEQ Cycle: 6 Channel : B
Instrument : 772_-_2 Rack/Vial: 0/0 Operator: mb
Sample Amount : 1.0000 Dilution Factor : 1.00



DEFAULT REPORT

Peak #	Component Name	Time [min]	Area [µV·s]	Area [%]
1		4.587	2121.00	0.07
2		5.445	607.00	0.02
3	peak 1	6.394	568.50	0.02
4		7.321	269.00	0.01
5		16.567	212.50	0.01
6		19.085	4509.00	0.14
7		23.578	1010.00	0.03
8		24.197	1671.22	0.05
9		24.615	3891.78	0.12
10		26.755	1407264.00	43.59
11		29.425	3470.00	0.11
12		30.597	63266.66	1.96
13		31.973	49614.67	1.54
14	peak 2	32.600	21457.42	0.66
15		33.156	4631.00	0.14
16		33.346	5647.06	0.17
17		33.947	12421.18	0.38
18		35.131	501128.63	15.52
19		35.612	14386.19	0.45
20		36.329	3586.18	0.11
21		37.804	1126495.00	34.90
			3228228.00	100.00

FIGURE 4.13: A print-out of the TDC tests on May 11, 1998, at 8.08 a.m. on the background which confirms the anomalous adhesion of magnetically polarized liquids.

Comprehensive tests via a very modern equipment for Liquid Chromatographic Mass Spectroscopy (LC–MS) with UltraViolet Detector (UVD) were conducted on the same GR fragrance oil "ING258IN Test 2" of Figures 4.1 and 4.2, on December 1, 1998, by Prof. ***Kenneth G. Furton,*** Chairman, and Prof. ***Piero R. Gardinali, Laboratory Director,*** *DEPARTMENT OF CHEMISTRY* of *FLORIDA INTERNATIONAL UNIVERSITY* (FIU), Miami, Florida. The tests were then repeated on December 117 and 18 by confirming the preceding results.

The tests were conducted under a number of technical charfacterizations specifically selected to detect magnecules, among which I recall:

1) Total Ion Chromatogram (TIC) collected under the positive ion atmospheric pressure electrospray ionization (ESI+) mode;

2) Integrated TIC with retention times and areas for the most abundant peaks;

3) Raw mass spectra for all peaks identified in item 2;

4) HPLC chromatograms collected at fixed wavelength of 254 cm;

5) UV–visible spectra form the HPLC diode array detector from 230– to 700 mm.

The tests were conducted on the following samples:

A) Sample GR331, the magnetically untreated, fully transparent GR fragrance oil "ING258IN Test 2";

B) Sample GR332, magnetically treated "ING258IN Test 2" with 10 % DiproPylene Glycol (DPG);

C) Sample GR332S, bottom layer of the preceding sample;

D) Sample GR335, magnetically treated mixture 4 % GR fragrance oil "ING258IN Test 2", 0.4 % DPG and 95 % tap water;

E) Sample GR335O, visible dark clusters in the preceding sample.

To avoid a prohibitive length of this presentation, in the following I only reproduce ten main print–out of the comprehensive and detailed documentation obtained at FIU (which is available in its entirety as Appendix V of Ref. [3f]).

Inspection of the print–outs (as well as the comprehensive documentation) shows that ***the tests conducted at FIU on GR fragrance oil "ING258IN Test 2" provide conclusive experimental evidence on the existence of magnecules in liquids.***

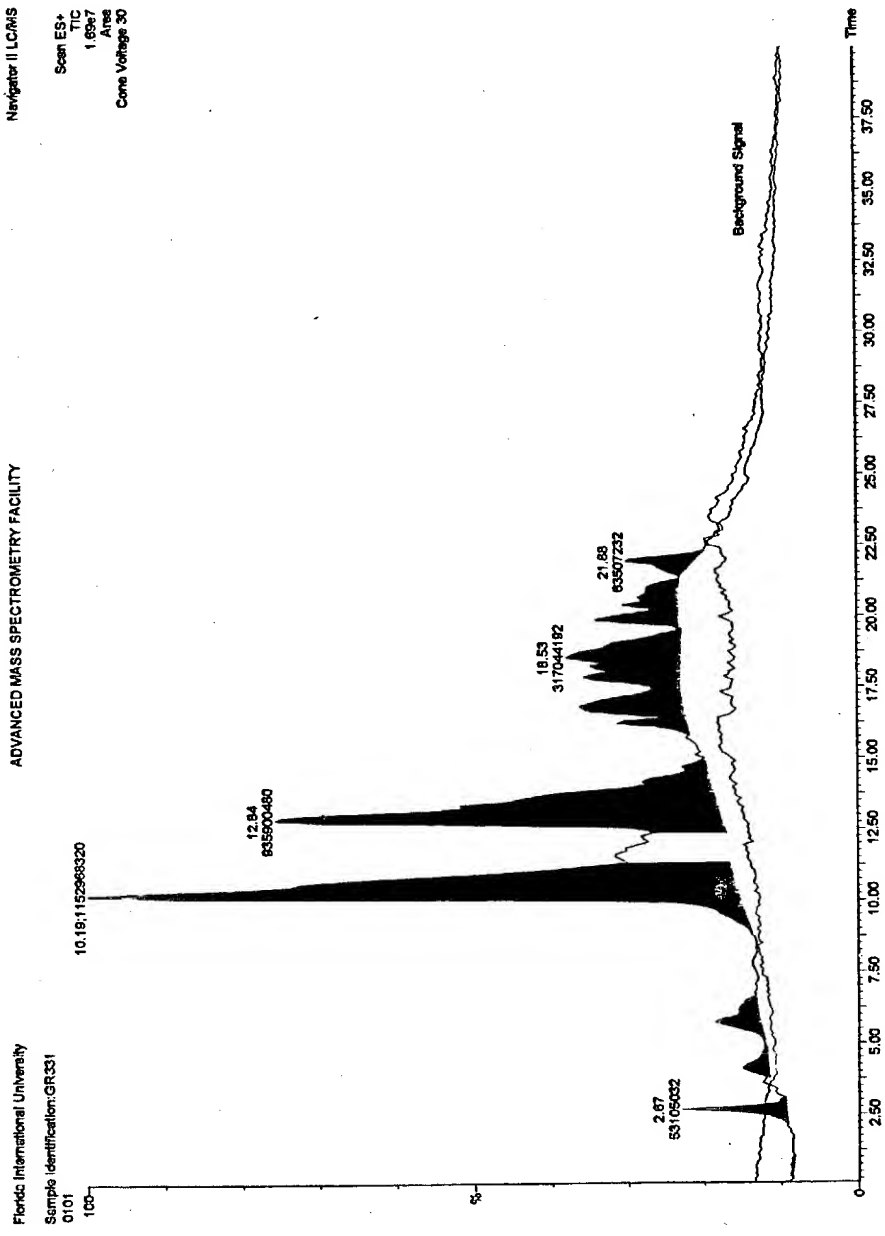


FIGURE 4.14: FIU scan on the untreated GR oil "ING258IN Test 2" of Figs. 4.1, 4.2.

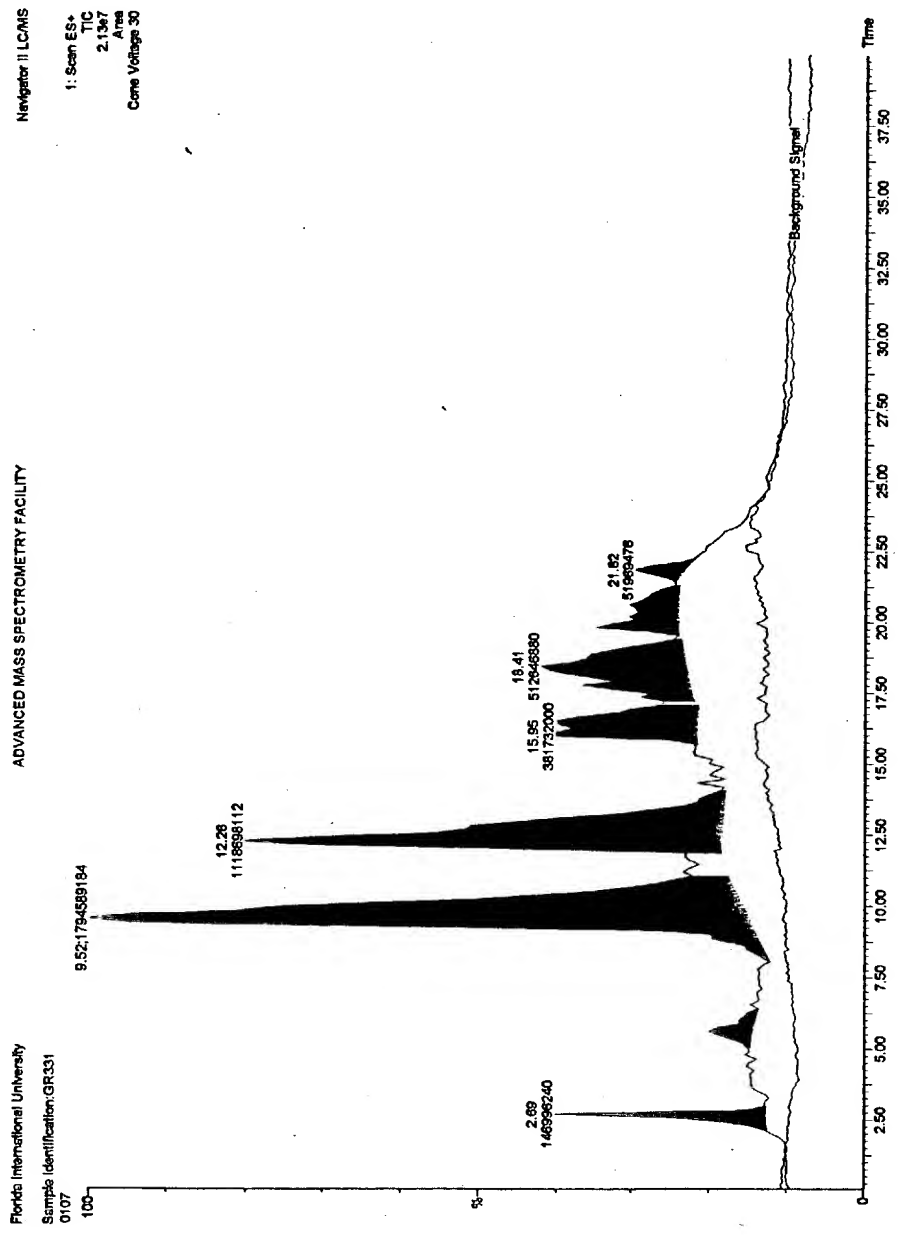


FIGURE 4.15: Confirmation of the preceding chemical structure.

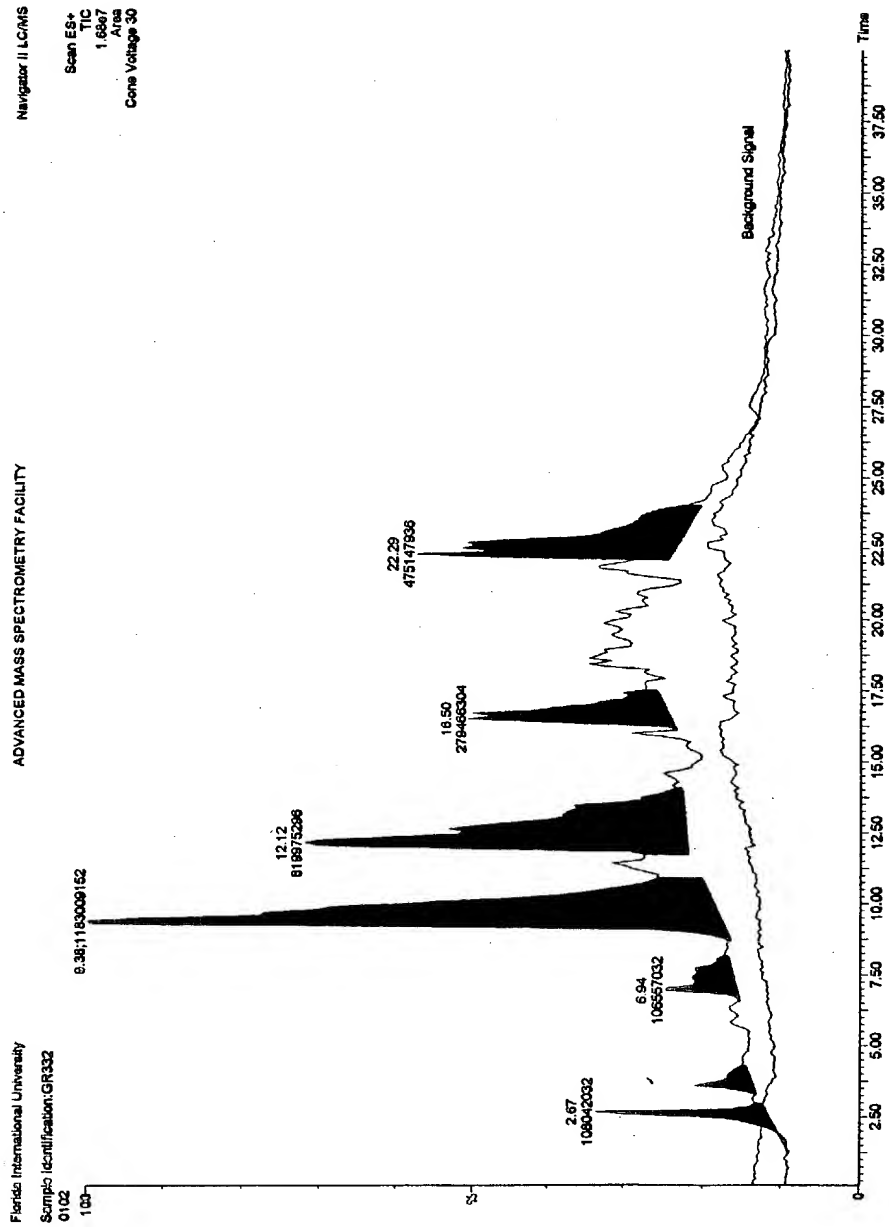


FIGURE 4.16: FIU scan on the chemical structure of the magnetically treated GR oil "ING258IN Test 2" with 10% DPGF. Note the initiation of the ***appearance of new peaks.***

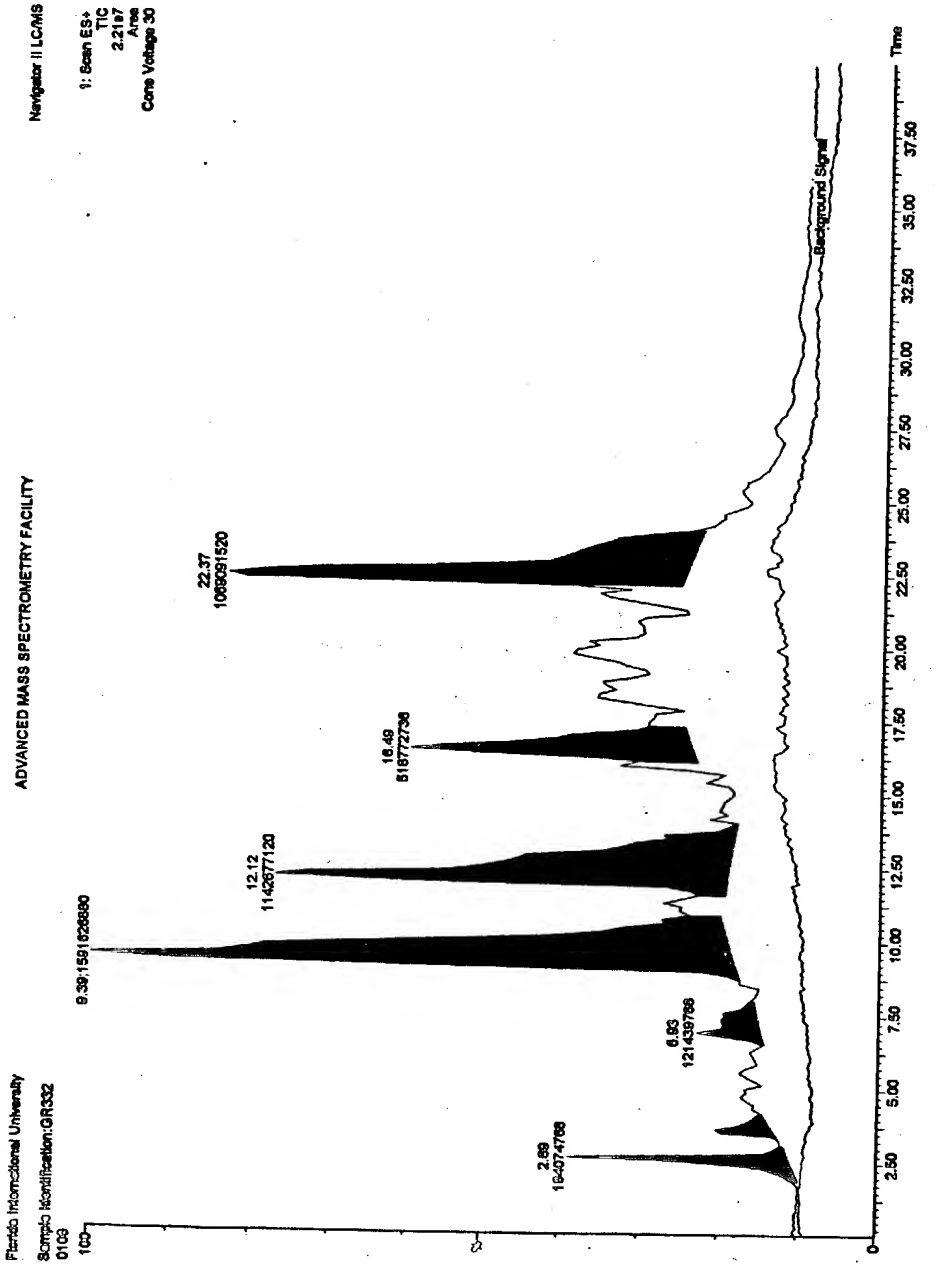


FIGURE 4.17: FIU scan on the chemical structure of the magnetically treated GR oil "ING258IN Test 2" with 10% DPGF. Note the ***large new peak on the r.h.s.***

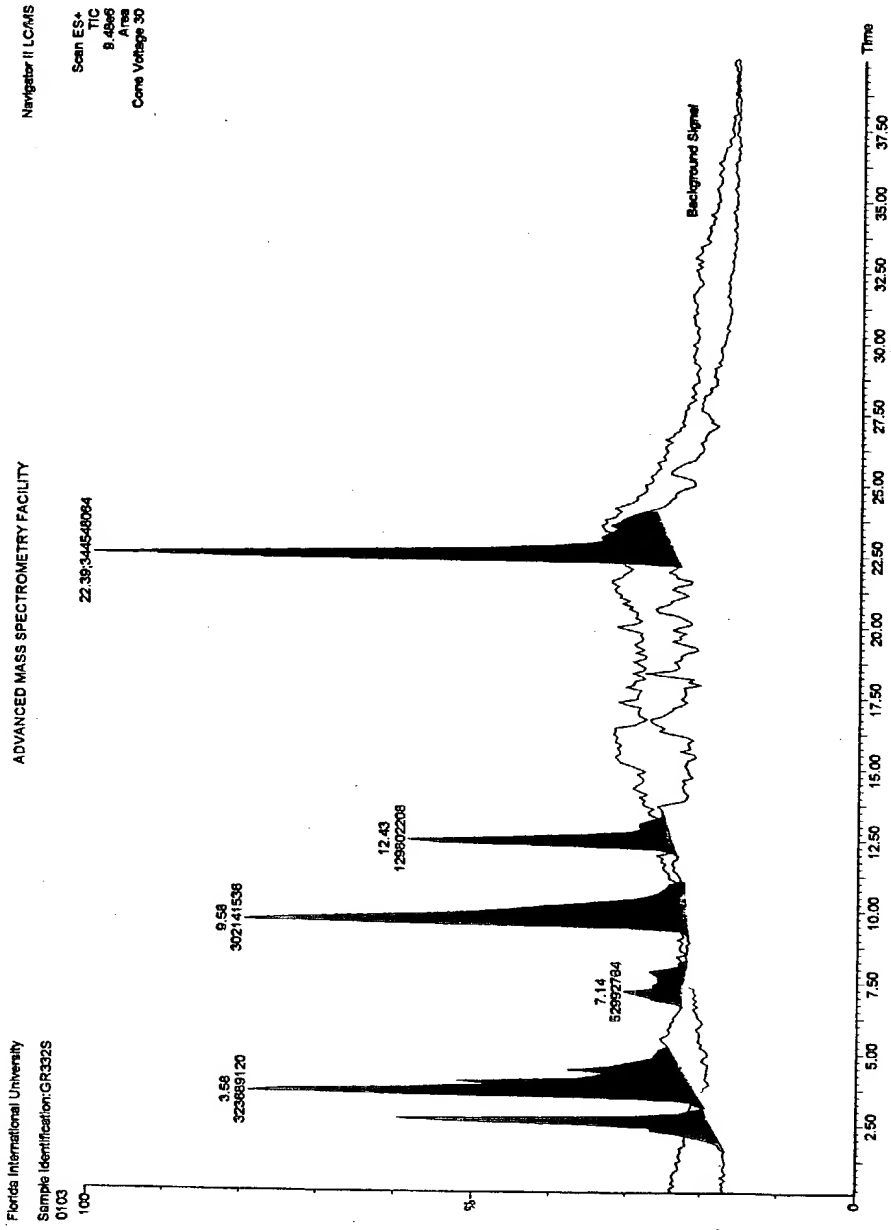


FIGURE 4.18: FIU scan on the chemical structure of the bottom layer of the sample of the preceding print-out. Note the ***large increase of the new peak in the r.h.s.***

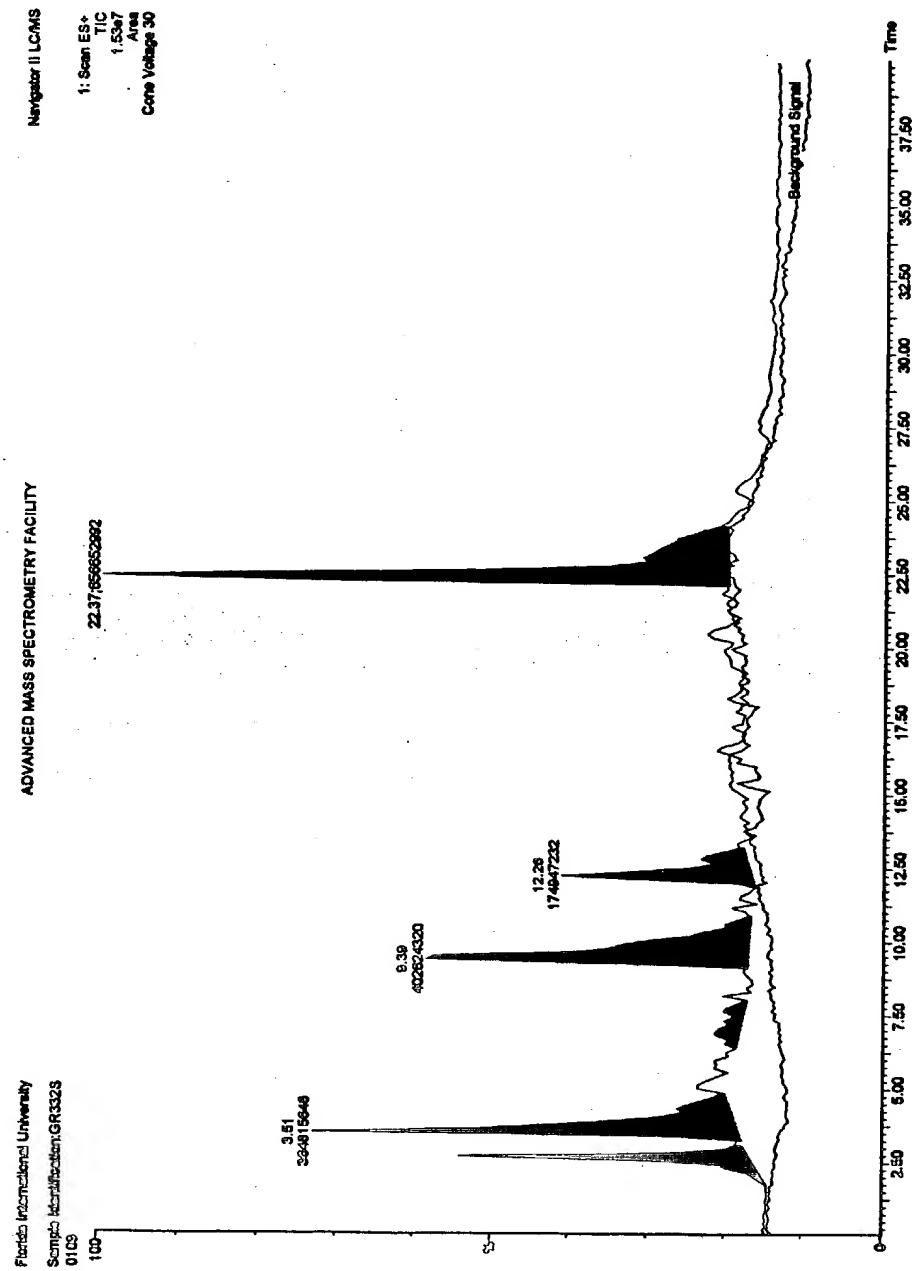


FIGURE 4.19: Confirmation of the preceding results.

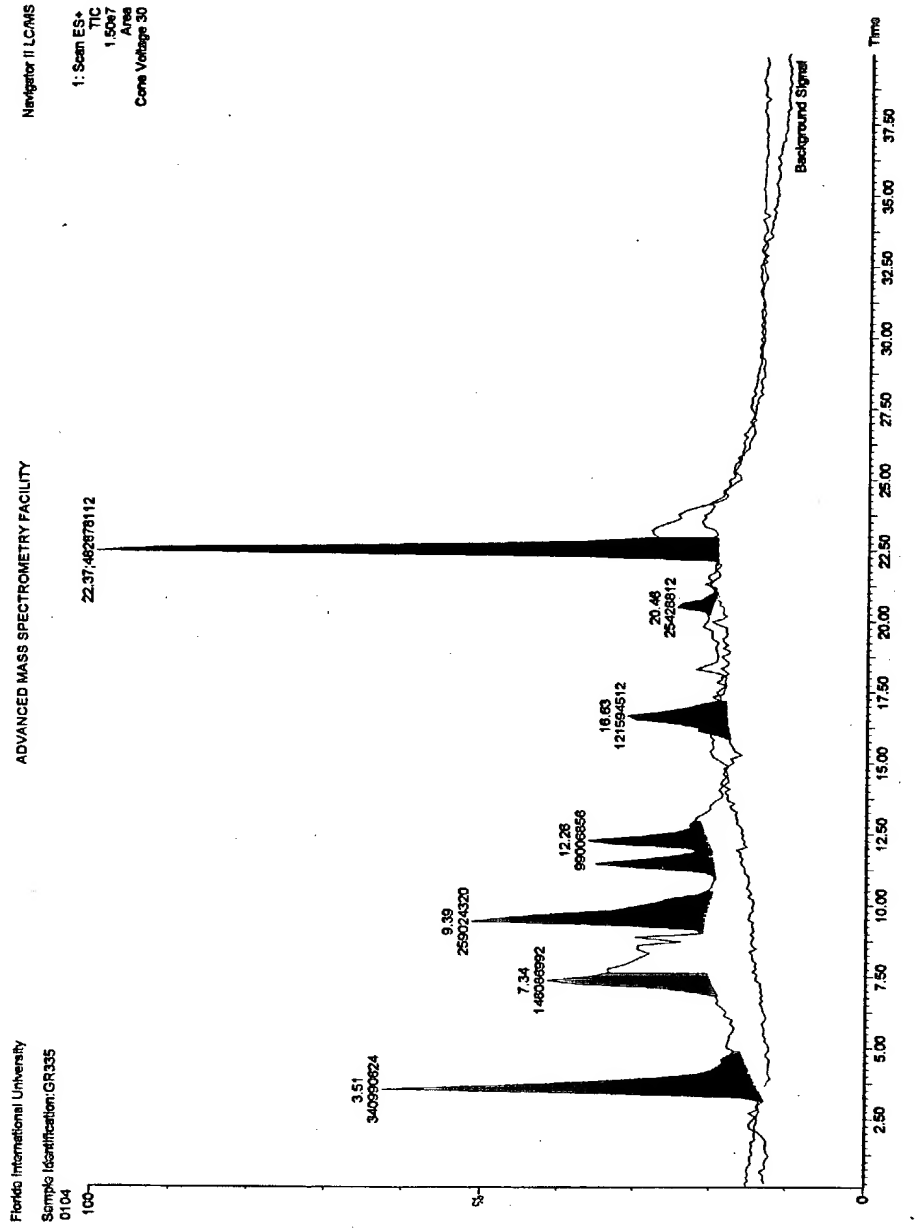


FIGURE 4.20: FIU scan on the magnetically treated 4 % GR oil "ING258IN Test 2", 0.4 % % DPG and 95 % tap water. Note ***the persistence of the large new peak in the r.h.s.***

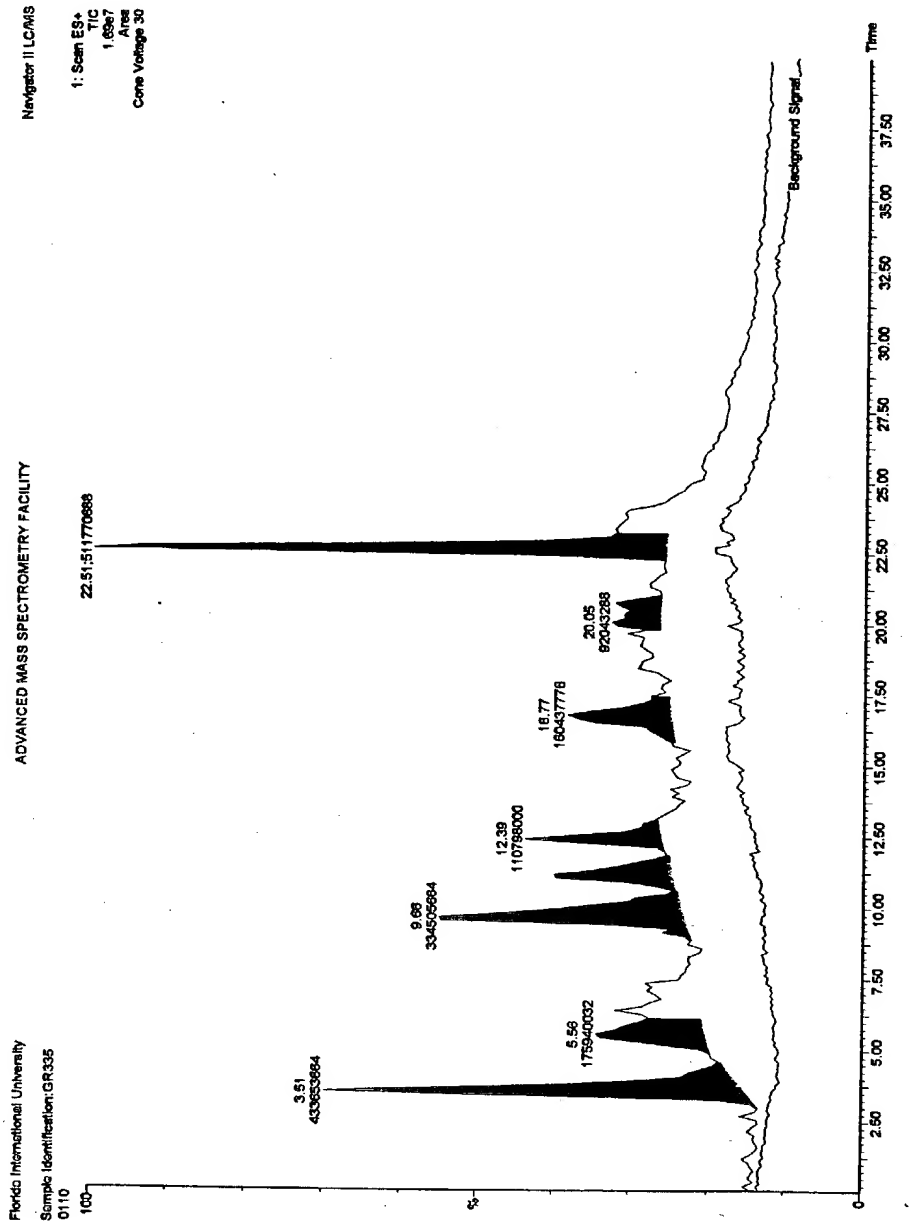


FIGURE 4.21: Confirmation of the preceding results.

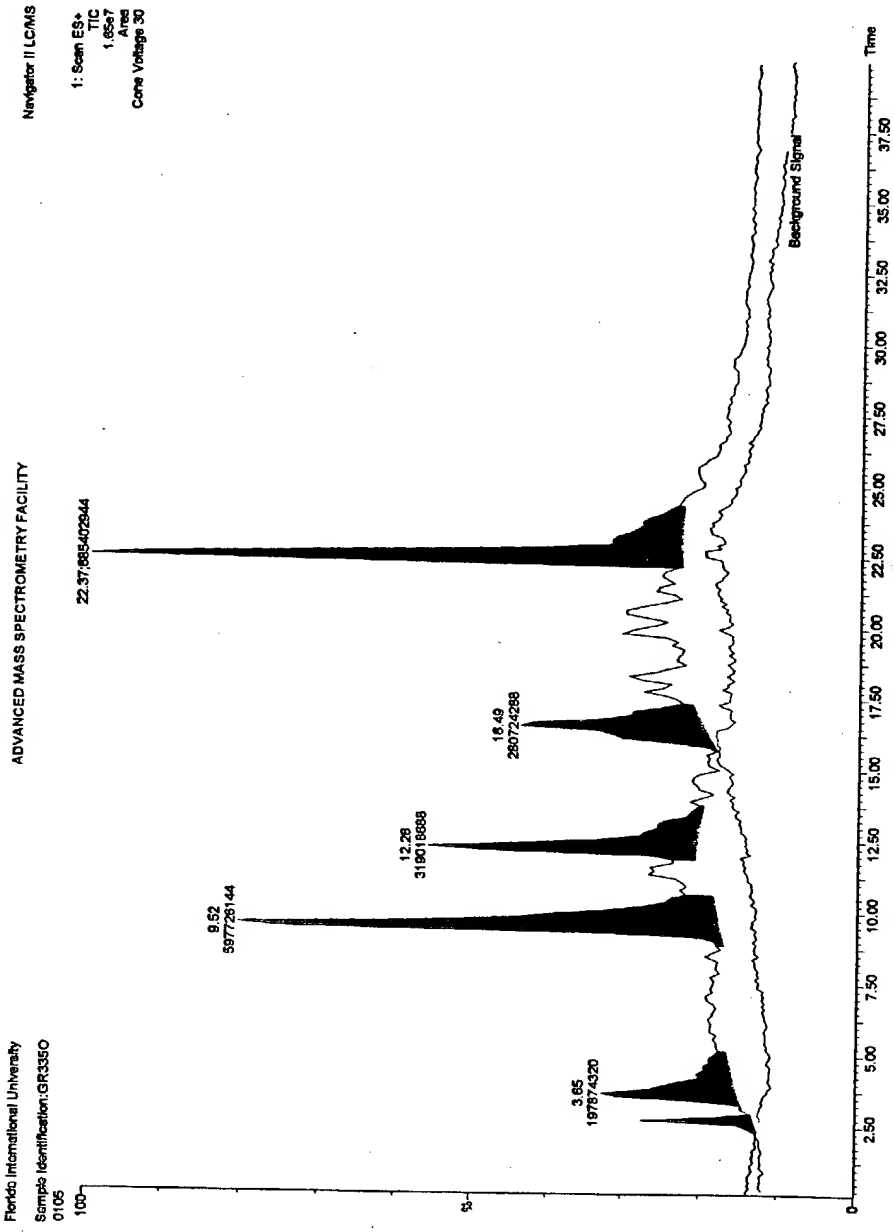


FIGURE 4.22: FIU scan on the large dark structures in the samples of the preceding print-out. Note the ***persistence again of the large new peak in the r.h.s.***

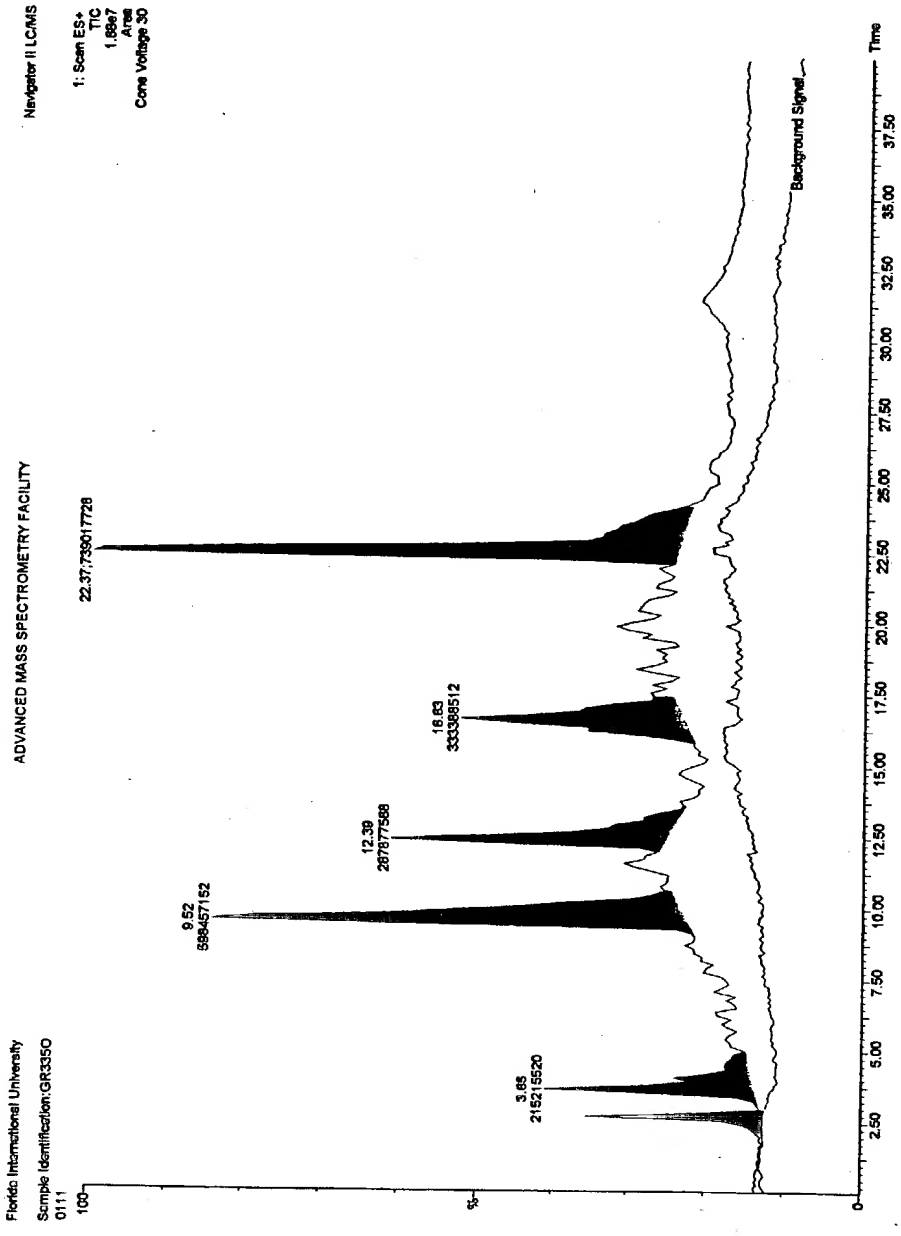


FIGURE 4.23: Additional confirmation of the preceding results.

4.4. Magnetic mutations of physical characteristics in liquids. The existence of magnecules in liquids implies necessary alterations, called *mutations*, of physical characteristics, such as increase of the specific density and viscosity. This is due to the fact that magnetic bonds among ordinary molecules imply an evident reduction of intermolecular distances, thus resulting in more molecules per unit volume as compared to the magnetically untreated liquid. The increase in viscosity is then consequential.

The reader should be aware up–front that I am not referring to esoteric changes in minute amounts, but rather to large macroscopic alterations often visible to the naked eye, which are at times such to alter completely the original state, as it was the case the complete loss of transparency and fluidity in the magnetically treated oils of Figures 4.3.

At a deeper level, it appears that the mutation of physical characteristics are due to various contributions, such as :

1) the elimination under a suitable magnetic field of (at least some of the) rotational motions of the molecules which, per se, implies a decrease of their average volume with consequential increase of the specific density;

2) the polarization of the orbits of the valence electrons which imply an additional decrease of the average molecular volume and consequential increase of the specific density, viscosity and other characteristics; and

3) the magnetic bond among different molecules which implies additional contributions to the indicated mutations.

In this section I report direct experimental evidence on measurements of specific density, viscosity and other characteristics which confirms the above prediction.

In all samples I used ordinary tap water and a number of GR fragrant oils. All samples here considered were prepared by conventionally mixing tap water and one fragrant oil and then submitting that mixture to rather weak permanent magnets of 200 G (much weaker than those used for Pictures 4.1 and 4.2) via an equipment protected by patent applications I am not at liberty to disclose at this time. All samples resulted to be very stable without any measurable change over a period of about year.

In early 1998 I prepared various samples along the above procedure numbered from 1 to 25. The measurements of the specific density were conducted on March 9, 1998 by analyst Dr. ***A. Sibille*** at the *SGS U.S. TESTING COMPANY, INC.* (USTC) of Fairfield, New Jersey under assistance by Mr. ***Lawrence Perovetz,*** President of *Millennium Corporation* (MC) of largo, Florida. The

results of the tests are presented in the following figure.

Sample 1 is ordinary untreated tap water. Sample 2 is ordinary tap water magnetically treated for about 5 minutes. Samples 3 and 4 were tap water treated with other magnetic equipment. Sample 5 was ordinary untreated GR fragrance oil received under the code of "APC Fragrance". Sample 6 was a mixture of fragrance oil 5 with tap water magnetically treated for about 5 minutes. Mixtures 7 and 8 were the same mixture 5 although treated with other equipment. Magnetically treated fragrance 17 was a GR oil received under the code "Air Freshener 1". Mixture 19 was Fragrance 17 with tap water 16 magnetically treated for 5 minutes. Note that all measurements of the following figure were done to an accuracy of the fourth digit. Therefore, numerical results up to the third digit can be considered accurate.

In the transition from Sample 1 [untreated water] to Sample 2 [magnetically treated water] there is an increase of the specific density in the macroscopic amount of 0.86% thus confirming the indicated magnetic mutation of water.

In turn, the increase in density clearly supports the existence of magneplexes in magnetically treated water, as detected earlier.

As well known, fragrance oils are (generally) *lither* than water, i.e., the specific density of the untreated fragrance in Sample 5 is *smaller* than that of the untreated water in Sample 1. According to quantum chemistry, the specific density of any mixture of the above two liquids, whether solution, suspension or dispersion, must be *in between* the lither and heavier specific densities.

On the contrary, as one can see in the following figure, ***the specific density of the magnetically treated mixture of GR "APC fragrance 1" with tap water, Sample 6, resulted to be bigger than that of the densest liquid, the water. This measurement constitutes additional, rather strong, direct experimental verification of the magnetic mutation of physical characteristics in liquids.***

The reader should be made aware that the above anomaly (a mixture of two liquids whose specific density is bigger than that of the heaviest of the two) *cannot* be explained via conventional quantum chemical knowledge. The presentation of scientifically credible opposing views is here solicited.

On the contrary, the anomaly is theoretically predicted and quantitatively treatable by the covering hadronic chemistry [3] via the creation of magnecules.

A remarkable point is that the ***magnetic mutations of density are macroscopically large.*** In fact, they were called by an analyst "UPS-type anomalies", meaning that the shipment via UPS of a given volume of a magnetically treated liquid requires an increase of the shipping cost due to the

macroscopic increase of the weight.

A further prediction of magnetically polarized liquids is the increase of its viscosity . This is evidently due to the arbitrary size of an individual magnecule, as well as the tendency of the same to bond near–by molecules, resulting in accretions, not mention the anomalous adhesion to the walls of the container which has been systematically detected for all magnetically polarized liquids.

As indicated earlier, in certain cases the increase of viscosity is so large to be first visible to the naked eye and, when the treatment is sufficiently protracted, the increase of viscosity is such to lose the customary liquid mobility.

Ordinary engine oils are particularly suited for magnetic treatment because their increase in viscosity is so dramatic to be rapidly visible to the naked eye jointly with a visible, also dramatic change in visual appearance (color, texture, opacity, etc.).

The measurements on viscosity are reported in a subsequent figure. They were done on March 9, 1998 by analyst **J. R. Tyminski** at *SGS U.S. TESTING COMPANY, INC.* of Fairfield, New Jersey, under assistance by *MILLENNIUM CORPORATION.* The selected engine oil was an ordinarily available 30–40 Castrol Motor Oil subjected to magnetic treatments via two different equipment called of Type A and B. All treatments were done at ordinary conditions in the outsider of the oil container without any additive or change of conditions of any type.

An one can see, ***measurement 2 shows a dramatic increase of the viscosity in the magnetically treated oil of 44.5% as compared to the viscosity of the untreated oil, while measurement 3 shows an increase in viscosity of 51.2%.***

The above experimental results evidently provide additional support for the the existence of magnecules.

The tests on viscosity also provide evidence of the anomalous adhesion of liquids with magnecules which is establishes in this case by a dramatic, macroscopic increase of adhesion of the oil to the walls of the glass container visible by the naked eye.

The same macroscopic anomaly is confirmed at the microscopic level. During the measurement of viscosity there was such an anomalous adhesion of the magnetically treated oils to the walls of the instrument that could not be removed via routine cleaning with acetone and required the use of strong acids.

This anomalous adhesion is further experimental evidence on the existence of magnecules because of their predicted capability to induce the polarization of the orbits of the valence electrons of the atoms in the walls of the container, thus resulting in anomalous adhesion via magnetic bonds due to induction.

REPORT OF TEST

SGS U.S. Testing Company Inc.
291 Fairfield Avenue
Fairfield, NJ 07004-3833
Tel: 973-575-5252
Fax: 973-244-1694

Report Number: 103947

Millennium Results

Density of	g/mL	% Change Density vs Ordinary Water
Sample #1	0.9805	0
Sample #2	0.9889	+0.86
Sample #3	0.9804	0
Sample #4	0.9853	+0.49
Fragrant #5	0.9720	NA
Mixture #6	0.9967	+1.65
Mixture #7	0.9982	+1.80
Mixture #8	0.9902	0.99
Treated Water #16	0.9893	0.89
Frag Treated # 17	0.9453	NA
Mixture #18	0.9902	0.99
Mixture #19	0.9929	1.26

Samples were transferred to a separatory funnel. The layers were allowed to separate. The water layer was withdrawn into a funnel with Whatman #4 filter paper. The filtrate was transferred to a preweighed 10 mL volumetric flask. The sample was weighed to 0.0001 grams and the density calculated.

When the samples were pure substances, they were transferred directly to preweighed 10 mL volumetric flasks.

Calculations:

Weight flask with sample - weight flask ÷ volume of flask = g/ mL

Arlyn Sibille, Ph.D.

FIGURE 4.24: USTC measurements of specific density on magnetically treated liquids.

REPORT OF TEST

SGS U.S. Testing Company Inc.
291 Fairfield Avenue
Fairfield, NJ 07004-3833
Tel: 973-575-5252
Fax: 973-244-1694

Report Number: 103947
Date: 03/09/98
Page: 1 of 1

SUBJECT: Three (3) samples received on 02/09/98

PURPOSE: Determine the density and viscosity of the three samples.

TEST DATE: 02/25/98

PROCEDURE: Three 10 milliliter volumetrtic flasks were pre-weighed. One of the samples was transferred to each of the volumetric flasks with a pipet. The samples were weighed again. The density of each sample was calculated.

The three oil samples were measured for viscosity using a Kinematic viscometer (ASTM D-445).

RESULTS:

Sample Identification	Density, g/mL)	Viscosity (cps)	Increase Viscosity, %
1) Motor Oil, "as is"	0.8682	199.8	0
2) Motor Oil, Treatment Type A	0.8714	288.7	44.5
3) Motor Oil, Treatment Type B	0.8689	302.0	51.2

SIGNED FOR THE COMPANY BY:

James R. Tyminski
Laboratory Supervisor

Arlyn Sibille, Ph.D.
Laboratory Director

/mo

Member of the SGS Group
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FIGURE 4.25: USTC measurements of viscosity on magnetically treated liquids.

It is evident that the magnetic mutations of density and viscosity implies the expected mutation of *all* other physical characteristics of the liquid considered. Measurements along these lines are solicited (see next section).

The existence of mutation of *physical* characteristics then implies the mutation of *chemical* features. At this moment I can indicate the visual evidence reported by the analysts of USTC according to whom the reaction of magnetically treated oils with acetone is dramatically different than that with untreated oil, beginning with a visual mutation in color, texture and other appearances. I am not at liberty at this moment to report additional evidence of chemical anomalies.

More importantly, the reader should be aware that ***chemical reactions of magnetically polarized liquids are predicted to experience a mutation of their thermodynamical behavior, resulting in certain case in an increase of calories per mole.***

Systematic studies on chemical mutations are under way and they will be reported at some future time.

4.5. Examples of industrial applications of magnetically polarized liquids. It is evident that ***all the anomalies in liquids identified in this section have novel industrial applications in a variety of fields, including, but not limited to, the fragrance industry, automotive industry, paint industry, adhesive industry, medicine, etc. These applications are under patent pending and other industrial protections.***

Evidently I am not at liberty to disclose these applications in the necessary details at this time. I can nevertheless present below illustrative lines (all under patent pending) that any scientist can easy derive form the indicated anomalies.

Applications to automotive industry, such as: the use in a gear box of a lubricant subjected to an appropriate magnetic treatment implies the presence of sufficient lubrication at start-ups after lack of use. When conventional lubricants are used, non-immersed gears are virtually dry after a few hours of lack of use; the enhancement of energy content and octanes; and others.

Application to paint industry, such as: the use of the increased penetration of magnetically treated liquids within porous surface to produce more efficient and longer lasting paints; or the use of magnetically treated marine paints for hulls of metal ships, which is expected to last longer than conventional paints, evidently. In fact, the magnetically treated paints induce a polarization of the atoms in the metal walls, thus resulting in an anomalous adhesion which is

typical of liquids with magnecules.

Applications to medicine, such as lotions subjected to the magnetic treatment herein considered, which are expected to penetrate the human skin much deeper than the same untreated lotions; or the study of conceivable new forms of local delivery of medications thru the skin (e.g., the deep local penetration of antibiotics in wounds), by therefore avoiding its current delivery to the entire body.

The above (and other) novel applications warrant additional scientific and industrial research and development on magnecules in liquids.

4.6. Evidence of magnecules in solids. In the preceding sections I have presented theoretical and experimental evidence of the existence of magnecules in gases and liquids.

The direct experimental evidence on the existence of magnecules in solids available at this writing is so simple to appear naive.

It is given by the evidence that ***all liquids with magnecules systematically preserve the new species when frozen, as established by the recovering of anomalous features when returning to the liquid state, as well as the preservation at the solid state of opacity and other features.***

Also, magnecules can be directly verified under microscopic observation to persist at the solid state.

Needless to say, the above simplest possible evidence in solids is only the beginning of various possibilities. I merely mention here in depth study on the true chemical composition of *solids created under intense magnetic fields,* such as fullerenes [5] and other composites.

The latter study is under way and I shall report the results in some future paper.

5. CONCLUDING REMARKS

In this memoir I have presented the theoretical prediction and several independent experimental verifications of the existence of a *new chemical species* I submitted under the name of *magnecules,* which is composed by clusters of atoms and molecules under a new strong bond of non–valence type and which is

stable at ordinary conditions.

The reason why this new species was not discovered time ago is the silence throughout this century in the vast literature of both quantum mechanics and chemistry of the magnetic moment created by the orbiting of valence and other electrons.

These magnetic moments are been ignored because of the general distribution in space of the motion of electrons, with consequential impossibility of their detection.

However, one of the most rigorous disciplines of this century, quantum electrodynamics, has established that electron orbits must acquire a polarization in a plane under sufficiently intense external magnetic fields, as well known in atomic physics.

Simple calculations for the hydrogen atom then show that the magnetic moment of its polarized electron orbit is 1,316 times *bigger* than the magnetic moment of the nucleus (the proton).

Such a large value of the orbital magnetic moment then sets the foundations of the new species of magnecules, as well as of the new technology for their production.

Quite remarkable are the variety and amount of alterations, called *mutations,* of physical and chemical characteristics under said magnetic polarization, which provide the foundations for numerous novel industrial applications.

Intriguingly, the results presented in this memoir constitute the most compelling experimental evidence known to me at this time on the *insufficiency* of quantum mechanics for the treatment of the hydrogen and other *molecules,* while being *exact* for the structure of the hydrogen *atom,* as illustrated in Fig. 1.4. The insufficiency of quantum chemistry is then consequential.

In fact, the assumption of quantum mechanics as being exact for molecular structures requires a point-like approximation of overlappings wavepackets of valence electrons, with numerous irreconcilable consequences in disagreement with experimental evidence, such as correlations among an arbitrary number of electrons, prediction of molecules with an arbitrary number of atoms, the ferromagnetic character of all molecules, and other inconsistencies.

The use instead of the covering quantum mechanics and chemistry allows the resolution of the above inconsistencies, by permitting the theoretical prediction and quantitative treatment of the new species of magnecules in a way compatible with experimental data to several digits.

Among the various macroscopic mutations induced by magnetic

polarizations, that I consider of fundamental character is the mutation of the infrared signature for gases or ultraviolet signature for liquids established in this paper by various independent chromatographic–spectrometric measurements (see, e.g., Figs. 3.4 and 3.8).

Such a mutation constitutes direct experimental evidence of a *mutation of conventional molecular structures,* because it generally implies the appearance of *new strong internal molecular bonds* which can only originate from the polarization of *internal electrons*, the valence electrons being used for conventional bonds.

In turn, these IR or UV mutations alone offers new scientific, industrial, medical and governmental applications, such as the dramatic increase of energy content reported in Section 3 [6b].

Needless to say, the studies reported in this memoir are at their first infancy and so much remains to be done.

To have an idea of the needed research, the entire current experimental knowledge on water [1c] needs to be reproduced when water is subjected to magnetic polarization. This includes the need to plot the behavior of the specific density, viscosity and other characteristics as a function of the intensity and geometry of the magnetic treatment; the behavior of the electric and magnetic susceptibility under magnetic polarizations; and other features.

Most important is the study of the behavior under sufficiently strong magnetic fields of the characteristic 105^{o} angle of the water between the two HO dimers which has been repeatedly measured for magnetically untreated water.

In principle, following the availability of sufficient theoretical and experimental knowledge, I do not exclude the possibility of the future laboratory construction of a "linearized water molecule", i.e., the molecule H_2O = H–O–H with 180^{o} angle between the two HO dimers.

By remembering the fundamental character of water for most of science, industry, medicine and government, the implications of these studies can well be beyond our predictive capabilities.

It is rewarding for me to note that the use of hadronic mechanics and chemistry offer, for the first time, the possibility of quantitative studies of a variety of physically different configurations of the water molecule which are simply inconceivable, let alone scientifically treatable, via the pre–existing quantum mechanics and chemistry.

All these new advances appear to have opened a new horizon in chemistry which, in view of its diversifications and implications, is beyond the capability of any individual scientist or industry, thus requiring a collegial participation.

Colleagues interested in participating in the ongoing research are encouraged to contact *THE INSTITUTE FOR BASIC RESEARCH* in Palm Harbor, Florida (e-address ibr@gte.net and Web site http://hom,e1.gte.net/ibr), and inquire about open theoretical, experimental or applied, and physical, chemical or industrial research problems and the related availability of financial support.

Acknowledgments

I have no words to express my sincere appreciation, esteem and gratitude to Professor ***Donald D. Shillady*** of the *DEPARTMENT OF CHEMISTRY* of *VIRGINIA COMMONWEALTH UNIVERSITY* in Richmond, Virginia, for his vision, dedication to the pursuit of new scientific knowledge, vast chemical expertise and continued suggestions, which permitted the recent construction of the hadronic chemistry, without which magnecules would have had no scientific foundations.

This memoir has also seen the light of the day because of the personal commitment, industrial vision, maturity of judgment and dedication to advanced technologies by Mr. ***Leon Toups,*** President of *TOUPS TECHNOLOGY LICENSING CORPORATION,* of Largo, Florida, to whom I have no words to express my appreciation, esteem and gratitude. It is a truism to state that, without his financial, logistic and industrial assistance, the discovery of magnecules would have been impossible.

Additional thanks are due to all other TTL members, including but not limiting to Mr. ***Mark Clancy,*** Mr. ***Michael Toups*** and Mr. ***Jerry Kammerer,*** Vice Presidents, Mr. ***William H. Richardson, jr.,*** Mr. ***Ken Lindfors,*** Mr. ***Andy Karpay,*** Mr. ***Jack Hansen,*** Mr. ***David McKinnon,*** Mr. ***Richard A. Lyons,*** Mr. ***Paul-John Normand*** Mr. ***Doug Palmer,*** Mr. ***James Wilcox,*** and others, for truly invaluable assistance in the difficult task of measuring physical anomalies.

Additional thanks are due to several executives and scientists at *GIVAUDAN-ROURE CORPORATION,* with headquarters in Teaneck, New Jersey, including but not limiting to: Mr. ***Andrew J. Herskee,*** Senior Vice President; Dr. ***Thomas McGee,*** Senior Vice President for; Mr. ***Kenneth L. Purzycki,*** Director of Fragrance Science; Dr. ***Konrad Lerch,*** Senior Vice President and Director of Corporate Research Laboratories in Dubendorf, Switzerland; and other GR members.

Further thanks are due to Mr. ***Lawrence Perovetz,*** President of *MILLENNIUM CORPORATION* (MC) of Orlando, Florida, for continued encouragement and assistance.

encouragement and assistance.

Additionally, I have no words to express my appreciation and gratitude to numerous independent analysts who,. by conducting various measurements on expected anomalies, proved to be real scientists. Among them I acknowledge measurements conducted by the following analysts under support from *TOUPS TECHNOLOGY LICENSING:*

> Analysts ***Louis A. Dee,*** Branch Manager, and ***Norman Wade*** of the branch of *NATIONAL TECHNICAL SYSTEMS* located at *MCCLELLEN AIR FORCE BASE* in North Highland, California;

> Analyst ***Kevin Lothridge*** of the *NATIONAL FORENSIC SCIENCE TECHNOLOGY CENTER,* in St. Petersburg, Florida;

> Analyst ***David Fries*** of the *OCEAN TECHNOLOGY CENTER* of *FLORIDA INTERNATIONAL UNIVERSITY* in St. Petersburg, Florida;

> Dr. ***N. Palibroda*** and Dr. ***P. Glueck*** of the *INSTITUTE FOR ISOTOPIC AND MOLECULAR TECHNOLOGIES* of Cluj–Napoka, Romania;

> Analysts ***Brain Wallace*** and ***Mia Burnett*** at the *TEKMAR–DOHRMAN CORPORATION* of Cincinnati, Ohio;

> Professors ***Kenneth G. Furton*** and ***Piero R. Gardinali*** of the Chemistry Department of the *FLORIDA INTERNATIONAL UNIVERSITY* of Miami;

> Professor ***M. Fetterolf*** of the *DEPARTMENT OF CHEMISTRY* of the *UNIVERSITY OF SOUTH CAROLINA* in Aiken;

> Dr. ***Arlyn Sibille*** and analyst ***James R., Timinski*** of the *SGS U. S. TESTING COMPANY* of Fairfield, New Jersey;

> Mr. ***Joek D. Rentz*** of *TRI–TECH CORPORATION* in Tampa, Florida;

> Analyst ***Shannon Smith*** then of the *EPA* facility in Tampa, Florida;
and others.

It is a duty for me to acknowledge also the invaluable assistance by the staff of various corporations, such as:

It is also a pleasure to thank the staff of numerous corporations, such as:

> *BRIGGS & STRATTON TEST CENTER* OF MILWAUKEE, WISCONSIN;

> *EPA* facility in Ann Arbor, Michigan;

> *MOTOR FUELER CORPORATION* of Largo, Florida;

> *COSA INSTRUMENTS,* of Norwood, New Jersey;

> *UNION CORPORATION* in Germany;

> *BADGER INSTRUMENTS,* Tulsa, Oklahoma;

> The *U. S. MILLER, LINCOLN AND THERMODYNAMICS CORPORATIONS;*

> *NASA* at Kennedy Space Center, Florida;

> *ATLANTIC ANALYTIC LABORATORY,* Whitehouse, New Jersey;

> *BIOMEDICS LABORATORIES* of Orlando, Florida;
> *SOUTHWEST MACHINE CORPORATION* of Nika, Missouri.
> *CAPOVANI BROTHERS CORPORATION* of Scotia, New York;
> *DIXIE ARC CORPORATION* of Birmingham, Alabama;
> *BUNTING MAGNETICS CORPORATION* of Newton, Kansas;
> *ELECTRON ENERGY CORPORATION* of Landsville, Pennsylvania;
> *ADAMS MAGNETIC PRODUCTS,* of Elizabethtown, Kentucky;
> *SHIN-ETSU RARE EARTH MAGNETS* of Tokyo, Japan;
> *CHEMYR P9OLYTECH LABORATORIES* of Maryland Height, Montana;
> *WELDING AUTOMATIC CORPORATION* of Anaheim, California;
> Various corporations producing high voltage pulse power units;
> Several other analytic laboratories, testing facilities and corporations.

I also want to express my appreciation and gratitude to numerous colleagues for invaluable consultations on various individual aspects of this research, including: Prof. ***Dieter Schuch*** of the *INSTITUTE OF PHYSICS* of *THE UNIVERSITY OF FRANKFURT,* Germany; Prof. ***Peter Gluck*** of the *INSTITUTE FOR ISOTOPIC AND MOLECULAR TECHNOLOGIES* of Cluj-Napoka, Romania; Dr. ***Eugene Mallove*** Founder and Editor in Chief of *INFINITE ENERG);* Professor ***Tepper L Gill*** at the *INSTITUTE FOR ADVANCED STUDIES,* Princeton, New Jersey; Professors ***William F. Pound*** and ***J. V. Kadeisvili*** of the *INSTITUTE FOR BASIC RESEARCH,* Palm Harbor, Florida;and numerous other colleagues.

Needless to say, I am solely responsible for the content of this memoir.

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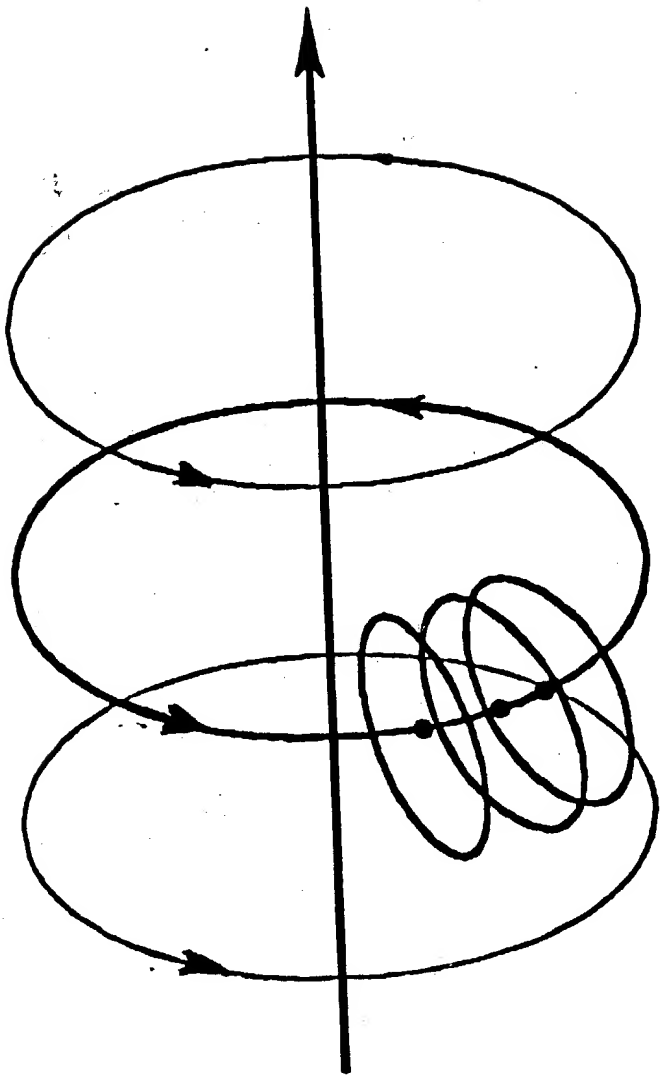

FIGURE 6: A schematic view of the creation of the new species of Santilli magnecules reproduced from Ref. [1]. A DC electric arc with about 3,000 A (represented with the vertical axis) creates a magnetic field (represented with circles perpendicular to the arc) that at atomic distances can reach values of up to 10^{11} Gauss, thus being suitable to polarize atomic orbitals into toroidal distributions (represented with circles perpendicular to the magnetic flux line). The electric arc also aligns polarized atoms one next to the other with opposite magnetic polarities North-South-North-South-etc., thus causing magnetic bonds. Individual toroidal polarizations are unstable. However, bonded polarizations of two or more atoms are stable at ambient pressure and temperature because rotations and oscillations occur for bonded polarized atoms as a whole.

Preprint of the Institute for Basic Research IBR-TC-034-01, of May 20, 2001,
revised March 15, 2003, revised August 10, 2003
submitted for publication

EXPERIMENTAL EVIDENCE ON A NEW HEAVY SPECIES OF HYDROGEN WITH SANTILLI MAGNECULAR STRUCTURE

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Abstract

In this note we present recent measurements indicating the apparent existence of a new species of hydrogen at the gaseous state with the specific weight of 15.06 a.m.u. while resulting to be composed of 99.2% Hydrogen that normally has specific weight of 2.016 a.m.u.; we make available the gas originally used for the production of said new species for independent re-runs of the measurements by interested colleagues; and we outline the most plausible theoretical interpretation of the new species available at this writing, that via the new chemical species of *Santilli magnecules* [1], whose formulation is solely based on the application to atoms of ordinary quantum electrodynamics without the rather fashionable assumption of new esoteric valence bonds having no clearly identified *attractive force* necessary for the bond. Alternative theoretical interpretations of the experimental data are encouraged, provided that they have equal plausibility and representational capability without experimentally unverified esoteric assumptions.

1. The Experimental Evidence on the New Species of Hydrogen. In this note we report an apparently new species of Hydrogen obtained by the Italian-American physicist Ruggero Maria Santilli via molecular sieving separation from a combustible gas produced via an underwater DC electric arc between Carbon-base electrodes. Quantum chemistry predicts that such a combustible gas is composed of 50% Hydrogen contained in a *mixture* (rather than a valence bond) with other Carbon-base gases, thus permitting separation via molecular filtering, pressure swing adsorption, and similar methods.

The new species of Hydrogen was separated at Adsorption Research Laboratory of Dublin, Ohio, by passing said combustible gas various times through a 0.5 nm zeolite, that, as well known, separates gases via a process called "molecular sieving," or molecular size exclusion. Santilli then obtained the following measurements on the new species of Hydrogen:

1) Following the separation of the new species, Adsorption Research Laboratory conducted in February 2001 measurements of specific weighty, and released a signed statement according to which the new species has the specific weight of 15.06 atomic mass units (a.m.u.), namely, 7.47 times the specific weight of conventional Hydrogen that has the specific weight of 2.016 a.m.u. (Figure 1).

2) In March 2001 SpectraLab of Largo, Florida, conducted analyses on the chemical composition of the same species of Hydrogen tested by Adsorption Research Laboratory via the use of Fourier Transform Infra-Red Spectroscopy (FTIRS) and other equipment. All measurements were normalized, air contamination was removed, and the lower detection limit was identified as being 0.01%. SpectraLab then released a signed statement according to which said species is composed of 99.2% Hydrogen, the rest being apparently given by 0.78% methane and traces of other substances (Figure 2).

3) In April 2001, Air Toxic Laboratory of Folsom, California, subjected the same sample of Hydrogen used in the preceding two tests to Gas Chromatographic Mass Spectrometric (GC-MS) scans via the use of a HP GC model number 5890 and a HP MS model number 5972. Air Toxic Laboratory then released a signed statement with computer print-outs of the scans showing the species to be composed of a dominant peak at about 2 a.m.u. representing Hydrogen, plus numerous additional peaks in macroscopic percentages that are unidentifiable by the computer search among known molecules (Figure 3).

The above analyses were repeated at different laboratories by confirming the indicated results. For instance, SpectraLab repeated the measurement of specific weight of the new species by confirming the value of 15.06 a.m.u. obtained by Adsorption Research Laboratory; the FTIRS tests done by Spectra Lab were repeated at Adsorption Research Laboratory by confirming the content of 99.2% Hydrogen; and the GC-MS scans of Air Toxic Laboratory were repeated by other laboratories confirming the presence of a major peak representing H_2 plus a series of unidentifiable peaks.

Santilli's new species of Hydrogen has an evident significance for the emerging new Hydrogen era, since the increased specific weight implies a corresponding reduction of storage volume, thus avoiding the expensive cryogenic liquefaction of Hydrogen currently needed to achieve sufficient range by the BMW, GC and other Hydrogen fueled cars; the underwater electric arc is notoriously much more efficient in the separation of water than electrolysis, thus implying a major reduction in Hydrogen cost; and the new species of Hydrogen is contained as a mixture with other gases, thus implying additional cost reductions compared to other methods of Hydrogen production based on the break-down of its valence bond, as it is the case for the reformation of fossil fuels.

In view of the above significance, the original combustible gas used in the production of the new species of Hydrogen is here made available on request to interested colleagues for the independent repetition of the separation of Hydrogen as well as the repetition of measurements 1), 2) and 3), under the sole condition of using the same equipment and procedures in view of difficulties in the detection of the new species outlined below.

2. The New Chemical Species of Santilli Magnecules. In view of the clear environmental significance of the new species of Hydrogen, it is essential to identify at least one plausible working hypothesis on its structure, since the latter is important for the optimization of production methods and further reduction of costs.

Since Hydrogen has only *one valence electron,* interpretations of the new Hydrogen species via valence bonds in any of their various forms are not plausible, besides having

no visible value due to the absence of a *numerical* interpretation of the data *without* the ratehr fashionable assumption of experimentally unverified, esoteric new forms of valence lacking a clearly identified *attractive force* as needed for the bond.

Therefore, Santilli's identification of the new species of Hydrogen has the far reaching scientific importance of mandating, apparently for the first time in chemistry, the search for *basically new bonds not based on valence.*

The second objective of this note is to report that, following a rather laborious search by the author, the most plausible hypothesis for the quantitative interpretation of the experimental data of Section 1 is given by the new chemical species of *Santilli magnecules* [1].

For the case of gases, magnecules can be defined as consisting of clusters of individual atoms (such as H, C, O, etc.), radicals (such as O-H, C-H, etc.), C-O in single valence bond, C=O in double valence bonds, and ordinary molecules (such as H_2, CO in triple valence bonds, H_2O, etc.), all bonded together by attractive forces among opposite magnetic polarities originating in toroidal polarizations of the orbitals of at least some of the peripheral atomic electrons when exposed to sufficiently strong (electric and) magnetic fields.

Stated in elementary language, natural distributions of electron orbitals in all space directions possess no well defined magnetic field. However, when the same electrons are caused to orbit within a toroid, quantum electrodynamics predicts the creation of a magnetic field with polarities North-South along the symmetry axis of the toroid. Santilli magnecules are merely given by two or more atoms with said polarization of their orbitals bonded together by opposing magnetic polarities North-South-North-South-etc. Their plausibility, also due to their solidf foundations on established disciplines, is then beyond scientific doubt.

The clusters of the new species of magnecules are identifiable by suitably selected GC-MS (Figure 4) operated according to procedures indicated in the next section. A given MS peak with a given a.m.u. value constitutes a Santilli magnecule when it remains unidentified by the computer search among all known ordinary molecules and, when tested under InfraRed Detectors (IRD), said peak admits no IR signature other that those of its constituents at lower a.m.u. value (Figure 5). For brevity we cannot here reproduce the numerous additional measurements and experimental evdience provided in Ref. [1].

The absence of an IR signature, specifically, at the a.m.u. value of the peak (rather than at the smaller a.m.u. values of its constituents) is crucial for the detection of Santilli magnecules, since it establishes the lack of valence character of the bond in view of the generally large a.m.u. value (see again Figure 4) under which valence bonds with perfect spherical symmetry (as needed for no IR signature) are practically impossible.

The identification of the new species of magnecules finally requires the occurrence of physical conditions necessary for its creation. By taking into consideration the existing literature (see, e.g., refs. [3a,3b] and large number of papers quoted therein), A. K. Aringazin [3c] conducted an in depth study on the toroidal polarization of atomic orbitals (reviewed in Appendix 8A of Ref. [1]), and confirmed the need of very high values of electric and magnetic fields as predicted by quantum electrodynamics.

Along these fully established lines, Santilli created the new species of magnecules detected in the scans of Figures 4 and 5 by flowing a liquid through a submerged electric arc (U.S. Patents numbers 6,183,604 and 6,540,966, and otehr patents pending). The liquid molecules are decomposed by the arc, and then mostly ionized, resulting in the formation of a plasma at about $10{,}000^o$ F. Since the magnetic field B of an electric arc (see Figure 6) is directly proportional to the DC current I and inversely proportional to the distance r, it is easy to see that at atomic distances of 10^{-8} cm from a DC arc with 10^3 A, orbitals are exposed to magnetic fields up to $10^{11} Gauss$, thus being amply sufficient to deform conventional spherical distributions of the orbitals into toroidal forms (see [1] for details).

Moreover, calculations originally done by Santilli [1] and confirmed by M. G. Kucherenko and A. K. Aringazin [3] have established that the magnetic field of a toroidal polarized Hydrogen atom is 1,415 times bigger than the nuclear magnetic field. These results not only identified concretely the *attractive force* needed for the creation of a bond (identification absent in several models of esoteric valence bonds), but also identified its *numerical value,* thus increasing dramatically the plausibility of the new species oof Santilli magnecules.

Needless to say, toroidal polarizations are, individually, highly unstable because they disappear immediately following the termination of the external field, in which case orbitals reacquire their natural spherical distributions. However, once two polarized atoms are bonded to each other via opposing magnetic polarities, the bond is indeed stable at ambient temperature and pressure, because rotations, vibrations and other motions due to temperature occur for the bonded couple as a whole. The same argument holds for bonds of more than two atoms, resulting in clusters conceptually illustrated in Figure 7.

It should be noted that the geometry of the DC electric arc is particularly suited for the new magnecular bond. As illustrated in Figure 6, said geometry is such to: achieve the needed toroidal polarization (illustrated in the figure with circles perpendicular to the local magnetic field line); naturally align polarized atoms next to each other with opposite magnetic polarities North-South-North-etc.; and force polarized atoms one against the other due to the magnetic field itself and other reasons (such as the Casimir effect).

From the presence of both electric and magnetic fields, Santilli called the new species "electromagnecules" [1] in order to distinguish it from the ordinary species of "molecules." In view of the dominance of magnetic over electric effects, the new species is now known as *Santilli magnecules.* Gases having a magnecular structure are called *MagneGases* and are now in industrial production and sale [1].

One should keep in mind the insistence in the *atomic* (rather than molecular) character of the polarizations here considered and related bonds [1]. As such, the new bonds apply irrespective of whether dealing with paramagnetic or diamagnetic molecules.

As an illustration, the Hydrogen molecule is known to be *diamagnetic,* thus being unable to acquire any appreciable *total* magnetic polarization. However, quantum electrodynamics establishes that individual *atoms* of a Hydrogen molecule can indeed acquire a toroidal polarization of their orbitals, thus permitting the bond at the *atomic* (rather than molecular) level.

A quantitative interpretation of the experimental data of Section 1 is then straightfor-

ward. By denoting with the symbol $-$ conventional valence bonds and with the symbol $\times$ the new magnecular bonds, all clusters of Figure 3 can be quantitative explained via cluster with structures of the type $H_3 = (H - H) \times H$, $H_4 = (H - H) \times (H - H)$, $H_5 = (H - H) \times (H - H) \times H$, etc. The species is then called *MagneHydrogen* and denoted with the new symbol MH.

At any rate, the measurements indicated in Section 1 provide strong experimental evidence in support of Santilli magnecules, precisely because conducted on Hydrogen. In fact, conventional valence bonds cannot possibly provide a credible explanation of the peaks detected at the a.m.u. values 3, 5, 6, 9, 10, 11, 12, etc. Moreover, the species was produced via a controlled molecular sieving with 0.5 nm openings. None of the latter species should, therefore, have been detected. The only plausible interpretation of the presence in a 0.5 nm zeolite of species so heavy is that the Hydrogen atoms and molecules are axially aligned along a common symmetry axis of magnetic polarization, thus have the capability of penetrating within said zeolite.

Note that the scans of Figure 3 confirm *the presence in magnecules of individual atoms without valence bonds,* since only this occurrence can explain the accretion from H_2 to H_3, from H_4 to H_5, etc. Broader experimental evdience of the presence of individual atoms in magnecules in provided in Ref. [1].

Note also that the species H_3 is often detected in GC-MS scans and appears to be created by the ionization process itself, rather than being present in the original substance. Santilli magnecules offer the new interpretation of H_3 as being composed of an H_2 molecule with a *magnetically* (rather than valence) bonded H atom. This new interpretation is compatible with the well established evidence that valance bonds occurs in *pairs* and not in triplets (see the analysis in Ref. [1], Section 8.4). At any rate, the geometry creating the species H_3 in the ionization process of GC-MS scans is essentially the same as that for the creation of Santilli magnecules (Figure 6).

The known existence of the species H_3 provides an evident support for the expectation of the heavier species H_4, H_5, etc., with the clarification that the creation of the latter species requires magnetic fields dramatically stronger than those of the GC-MS ionization process [2], precisely as done by Santilli in the creation of his magnecules.

The lack of detection of methane by the GC-MS scans while detected in 0.78% by the FTIRS tests constitutes yet another illustration of the novelty of the field. In fact, CH_4 cannot exist in the original gas because created at the $10,000^o$ F of the electric arc. Also, methane could not have been adsorbed by the molecular sieving process due to insufficient intermolecular sizing. Assuming that, somehow, its passage escaped the analysts, the macroscopic presence of 0.78% methane should have been detected by the GC-MS, while the scan of Figure 3 reveals no appreciable peak at 16 a.m.u. Even assuming that all these diversified inconsistencies could be somehow bypassed via machinations to salvage valence bonds, the final resolution is provided by *the absence in the species of the IR signature belonging to the methane.*

Note finally that *Santilli magnecules are solely based on conventional quantum electrodynamics applied to conventional atomic structures, are fully compatible with conventional quantum mechanics, and require no assumption of esoteric and hypothetical bonds often*

without a clearly identified attractive force. As such, Santilli magnecule provide a plausible and quantitative interpretation of the measurements of Section 1. Alternative theoretical interpretations are here solicited, provided that they have the same plausibility, permits an equally quantitative representation and, above all, are not based on hypothetical and unverified new versions of the valence without a clearly identified *attractive force* necessary for a credible interpretation of the bond.

3. Analytic Difficulties in Detecting Magnecules via Molecular Methods. A word of caution should be voiced for colleagues interested in their independent detection of Santilli magnecules, because the currently available equipment has been developed for the detection of the *different* species of molecules. These difficulties are identified in detail in Ref. [1]. To render this note self-sufficient and by asking leniency to readers since the author is also a theoretical physicist, the difficulties can be summarized as follows.

A **first problem** is due to the fact that different molecules have clearly different features characterized by different peaks in the MS or IR scans. Therefore, one single detection (for instance, one via a GC-MS) is generally sufficient for molecular identifications. While fully valid for molecules, this procedure is no longer acceptable for Santilli magnecules whose identification requires the use of *at least two different detections.*

For instance, the detection in the FTIRS of a peak representing methane is no longer sufficient for a scientific identification, and at least one second identification is necessary to avoid "experimental beliefs." As indicated earlier, methane detected in the FTIRS scans of Figure 2 was not confirmed in the GC-MS scans of Figure 3. In any case, methane cannot be present in 0.5 nm zeolites and cannot survive at the $10,000^o$ F of the plasma creating the gas. Similarly, the detection in a GC-MS alone of a peak at 4 a.m.u. is no longer sufficient for a scientific identification of the peak with Helium, because, until disproved, the possibility that the 4 a.m.u. peak could be the magnecule $H_4 = (H - H) \times (H - H)$ cannot be dismissed ligthly, e.g., in forensic procedures.

The best instrument recommended for the detection of magnecules (as well as for conventional molecules) in gases is a GC-MS necessarily equipped with IRD [1]. The GC-MS/IRD first permits the identification of a peak in the mass scans, and then permits the study of the specific peak considered under the IR scan, resulting in a dual measurement of the same peak. For instance, analysts Louis A. Dee and Norman Wade of NTS laboratories at the McClellan Air Force Base in Sacramento, California, selected for the scans of Figures 4 and 5 an HP GC model 5890, an HP MS model 5972, and an HP IRD model 5965.

The use of two separate instruments, that is, the GC-MS and, separately, the IRD for the test of the same gas is strongly discouraged, because not leading to final analytic results, again, because the peaks identified in the GC-MS are not generally kept in the IRD when separately used, resulting in two generally different analytic results whose reconciliation is reduced to theoretical conjectures one way or the other.

The presence in the GC-MS of the IRD is truly crucial for the detection of magnecules. This is due to the appearance of numerous peaks in the GC-MS that, according to long standing practice by chemists, may be subjected to an interpretation via one given molecule or another. The main function of the IRD is to show that *a magnecular peak has*

no IR signature at its atomic weight (see Figure 5), thus excluding the possibility that such a peak can represent a molecule due to its generally large atomic weight for which no perfect spherical symmetry is credible.

Needless to say, magnecules do have IR signatures for the *constituents* of the considered peak at much smaller a.m.u. values. For instance, the MS peak of Figure 4 at 257 a.m.u. may have a clear IR signature for *CO*, another for CO_2, another for H_2O, another for C-H, etc., all signatures belonging to molecules and/or radicals actually existing in the peak considered. The point is that *these signatures do not occur at the 257 a.m.u. of the considered MS peak and, consequently, they cannot possibly identify the nature of that peak.* When the IRD is attached to the GC-MS, its setting at 247 a.m.u. gives the IR signature of that peak and not of its constituents.

A **second problem** in the detection of magnecules is that contemporary analytic equipment are designed for fast and efficient commercial detections, for which scope they generally have strong ionization or other detection processes. The full validity of these instruments for the detection of molecules is, again, out of question here, because valence bonds are very strong and the ionization energy is known to be below the valence fragmentation value. This second problem originates when these molecular instruments are used to attempt the detection of magnecules, because their bond is weaker than the molecular one, and the ionization energy of the instruments can be bigger than the fragmentation energy, in which case the instruments produce beautiful results, although solely applicable to the *fragments,* and not to the species itself.

In the absence of an analytic instrument specifically designed to detect molecules and magnecules, the only recommended solution is the selection of the detection process and its setting admitting the smallest possible fragmentation. For instance, to reach the scans of Figures 4 and 5, analysts Louis A. Dee and Norman Wade operated their GC-MS/IRD at the lowest ionization voltage, and the same approach was used by the analysts of Air Toxic Laboratory to reach the scan of Figure 3. It is an instructive exercise for interested analysts to personally eyewitness the fact that GC-MS scans of gases with magnecular structure conducted at minimal and maximal ionization voltages produce substantially different mass spectra.

Another illustration of the difficulties in detecting magnecules with molecular instruments is given by the fact that flame ionization generally detects no magnecular structure at all, because the temperature of the ionization method can be bigger than the Curie temperature of the species, under which temperature all magnetic polarizations disappears according to a well established physical law.

These are the reasons why, to reach the scans of Figures 4 and 5, analysts Louis A. Dee and Norman Wade used their GC-MS/IRD at the lowest possible operating temperature. In addition, they even cooled cryogenically the feeding line to assure the lack of alteration of the species due to ambient temperature.

A **third problem** is caused by the use of micrometric feeding lines whose applicability to conventional molecular gases is, again, out of question, while the scientific detection of magnecules require the use of the largest possible feeding line, e.g., those with 0.5 mm diameter. Being originally sceptical on this issue, the author has personally eyewitnessed

the fact that a GC-MS with a feeding line of 0.1 mm provided no scan all all, while the sole change of the feeding line into one of 0.53 mm diameter yielded a large mass spectrum.

The only interpretation the author can provide on this occurrence is that reported by Santilli [1], namely, that feeding lines with very small sectional areas are clogged up with magnecules attached to the walls of the lines because of the well known magnetic induction, thus resulting in the possible occlusion of the line itself. In conclusion, the use of very small feeding lines generally prevents the species to be tested from even entering into the instrument, let alone conducting any measurement of any scientific value.

A **fourth problem** is given by the elusion time that, in contemporary commercial instruments, is generally reduced to a minimum to increase productivity. Again, the use of GC-MS with small elusion times is fully acceptable for the detection of molecules, because their separation is assured by the high ionization voltage and other procedures. However, the use of short elusion times generally prevents the detection of magnecules. In fact, to reach the scan of Figures 4 and 5, analysts Louis A. Dee and Norman Wade set their GC-MS/IRD at the maximal allowed elusion time of 21 minutes. As reported by Santilli in Ref. [1], the same gas tested with the same instrument but operated at another laboratory for less than one minute elusion time yielded the grouping of the various peaks of Figure 4 into one single peak (see Figures 8.13 and 8.14, pages 346-347, Ref. [1]), in which case no scientific identification of the structure of the species is possible.

Yet **other problems** in the identification of magnecules are given by protracted use of procedures fully established for the detection of molecules. For instance, analysts customarily check the blank of the instrument before and after the scans, to verify that the instrument is properly working. Following the removal of the gas from the instrument, in the event the blank shows the detection of anomalous peaks, the entire analysis is usually rejected on grounds that the instrument failed to operate properly.

The validity of this procedure for the detection of molecules is, again, out of questions. However, for the case of magnecules the occurrence is exactly the opposite as that for molecules. In the event there is no anomalous peak in the blank following the removal of the gas, the analysis is generally defective and should be discarded, e.g., because the species was too large for the selected feeding line and, therefore, the only species that entered into the instrument was that of the molecular *constituents,* or the magnecular structure was destroyed by the detection process. In reality, the presence of anomalous peaks in the blank following the removal of the gas is another direct experimental evidence of the magnetic polarization of the species due to its adhesion to the interior of the instrument via magnetic induction, thus implying the presence of residual gas in the instrument following its removal.

The internal adhesion of gases with magnecular structures is actually such that, following their use to detect magnecules, instruments generally fail to provide routine detections of ordinary molecules, unless they are flushed with an inert gas at high temperature until they regain the standard blank in the absence of detections.

The above and other analytic difficulties illustrate the reason why Santilli magnecules escaped identification throughout the 20-th century. The same difficulties illustrate the need of extreme caution in venturing a conventional molecular interpretations for any

species in which the new magnecular structure is suspected.

The reader should be aware that, in addition to the original, rather vast experimental evidence on the existence of Santilli magnecules presented in monograph [1], and the new experimental evidence presented in this note, rather vast additional evidence is under finalization for presentation in subsequent papers. Admittedly, the theoretical interpretation of the new chemical species as originating from the toroidal polarization of orbitals is only the most plausible at this writing and, as such, must be subjected to scientific scrutiny.

The important point established by the experimental evdience here considered is the existing in nature of *new bonds not due to valence,* a result that is *per se* a momentous contribution by Santilli to chemist, besides the achievement of a numerically exact representation of experimental data on conventional molecules that preceding the discovery of magnecules [1].

References

[1] Santilli R.M., *Foundations of Hadronic Chemistry with Applications to New Clean Energies and Fuels*, Kluwer Academic Publisher, Boston-Dordrecht-London, 2001.

[2] Landau, L.D. and Lifshitz E.M.: *Quantum Mechanics: Non-Relativistic Theory*, 3rd ed., Pergamon, Oxford, 1989 [2a]. Ruder, H., Wunner, G., Herold, H. Geyer, F.: *Atoms in Strong Magnetic Fields*, Springer, Berlin-Heidelberg-New York, 1994 [2b]. A.K. Aringazin, *Hadronic Journal* **24**, 395 (2001) summarized in Appendix 8A of Ref. [2c].

[3] M.G. Kucherenko and A.K. Aringazin, *Hadronic Journal* **21**, 895 (1998).

ADSORPTION RESEARCH INC.

6175-D Shamrock Court
Dublin, OH 43016

Gas	Molecular Weight (g/mol or amu/molecule)
MagneGas™ [Feed]	15.60
MagneHydrogen™ [Product]	15.06
Ordinary Hydrogen [for comparis	2.016

FIGURE 1: A reproduction of the main results of the signed statement released by Adsorption Research Laboratory of Dublin, Ohio, on the measurement of the specific weight of: 1) the original gaseous feedstock (called "MagneGas") with specific weight of 15.60 a.m.u.; 2) the new species of Hydrogen obtained via molecular sieving on 0.5 nm zeolites (called "MagneHydrogen") with specific weight 14.06, and 3) conventional Hydrogen H_2 with specific weight 2.016 a.m.u. According to these measurements, independently repeated and confirmed by other laboratories, the specific weight of the new species of Hydrogen is 7.47 times that of conventional Hydrogen. Note that the specific weight of 15.06 a.m.u. was reached by passing the feedstock gas several times through the zeolite. As a result, the specific weight of 14.06 a.m.u. is not expected for an industrial production of the species based on only one passage.

SPECTRALAB
6349 82nd Avenue North
Pinellas Park, Florida 33781
Phone: (727) 545-2297 • Fax (727) 547-8024

Component	Gas
Hydrogen	99.2
Carbon monoxide	None detected
Carbon dioxide	None detected
Methane	0.78
Ethane	None detected
Ethene (ethylene)	None detected
Ethyne (acetylene)	None detected

FIGURE 2: A reproduction of the main results of the signed statement on the chemical analysis of the same sample of Hydrogen used for the test of Figure 1 released by SpectraLab of Largo, Florida, via the use of FTIRS and other detectors showing that the species is composed of 99.2% Hydrogen. Note also the detection of 0.78% methane that, however, is an unconfirmed "experimental belief" because: methane cannot pass through the 0.5 nm zeolite used for the tests; methane is not confirmed at all (let alone in the macroscopic 0.78%) by the GC-MS tests of Figure 3 due to the absence of any appreciable peak in the neighborhood of 16 a.m.u.; and methane cannot be present in the original feedstock gas since the latter is produced at about 10,000° F of the electric arc.

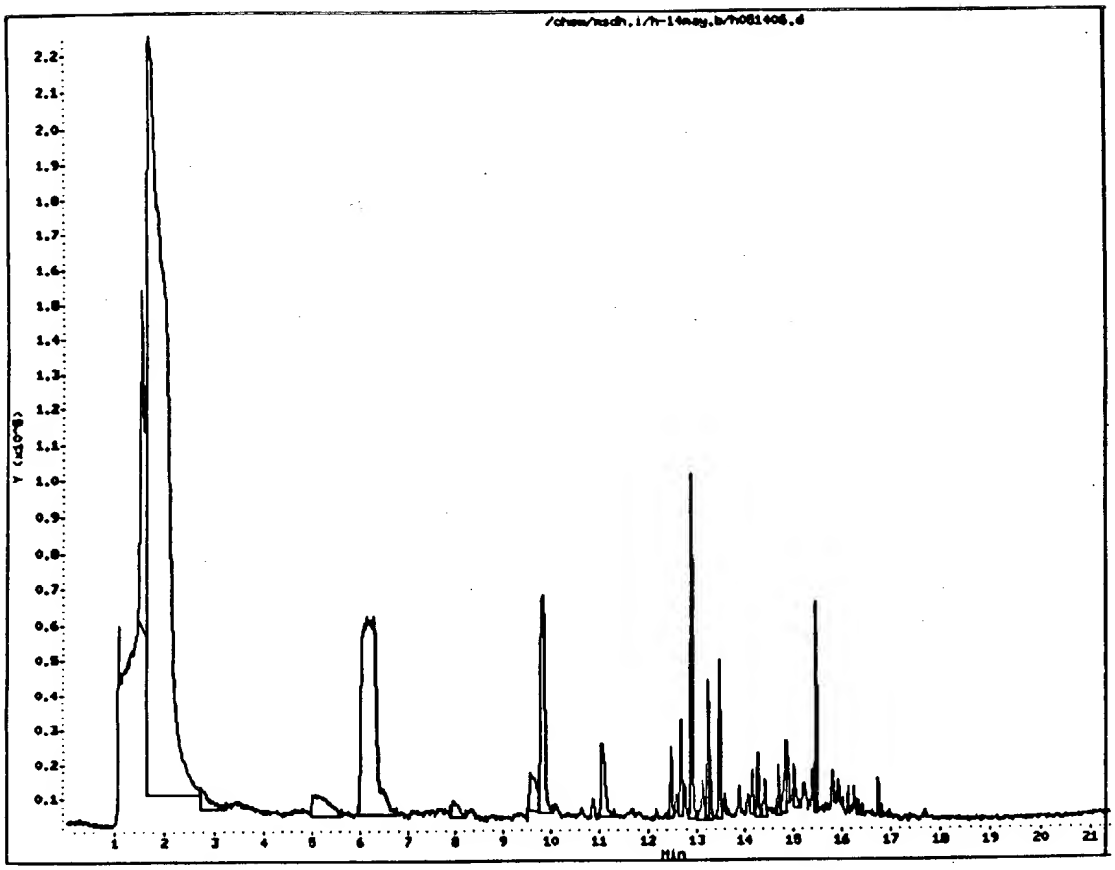
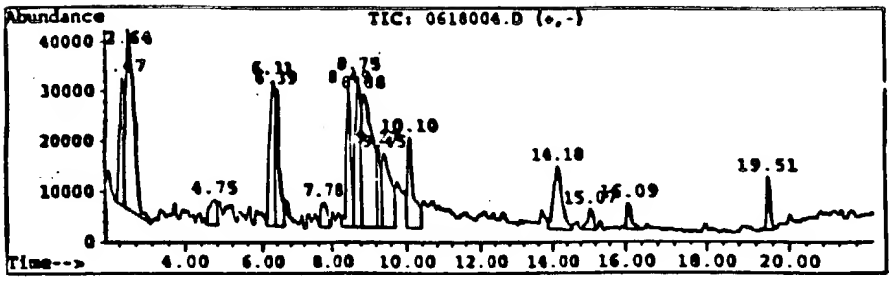


FIGURE 3: One of the several GC-MS scans done by Air Toxic Laboratories in Folsom, California, on the same new species of Hydrogen tested by Adsorption Research Laboratory for specific weight and SpectraLab for chemical composition. Besides the large expected peak at 2 a.m.u. representing H_2, note the numerous additional peaks in macroscopic percentage at 3, 5, 6, 9, 10, 11, 12, etc., a.m.u. Note the absence of any appreciable peak at 16 a.m.u. as needed to represent the methane detected by the FTIRS of the measurements of Figure 2.



Retention Time	Area	Area %	Ratio %
Total Ion Chromatogram			
2.474	1753306	5.386	32.724
2.644	5091514	15.641	95.030
4.754	641528	1.971	11.974
6.307	2737749	8.411	51.098
6.390	2211258	6.793	41.272
7.782	592472	1.820	11.058
8.490	2357396	7.242	43.999
8.754	2784829	8.555	51.977
8.882	5357012	16.460	100.000
9.265	1121809	3.452	20.975
9.448	2421234	7.438	45.191
10.098	1946292	5.979	36.326
14.177	2129791	6.543	39.751
15.073	435208	1.337	8.123
16.085	389822	1.198	7.276
19.509	577433	1.774	10.777

FIGURE 4: A reproduction of the first detection of the new chemical species of Santilli magnecules reported in Ref. [1] done at the National Technical System laboratory located at McClellan Air Force Base in North Island, near Sacramento, California, on June 19, 1998, by analysts Louis A. Dee and Norman Wade who operated a GC-MS equipped with IRD (HP GC model 5890, an HP MS model 5972, and an HP IRD model 5965). The species consists of a gas produced via a DC electric arc submerged in ordinary water. As such, quantum chemists predicts that the heaviest expected element was CO_2 at 44 a.m.u. To avoid the very large peaks for H_2 and CO, the mass range was restricted from 40 a.m.u. to 500 a.m.u. As one can see, the species showed no clearly identifiable and isolated peak at 44 a.m.u., with the presence instead of numerous peaks in macroscopic percentage all the way to 500 a.m.u. None of these peaks could be identified by the computer among all known molecules existing in the memory banks of the McClellan Air Force Base (see [1] for details). Note that the lack of identification with known molecules is not sufficient, per se, to claim the detection of a new non-valence chemical species due to the need of separate confirmations by other instruments.

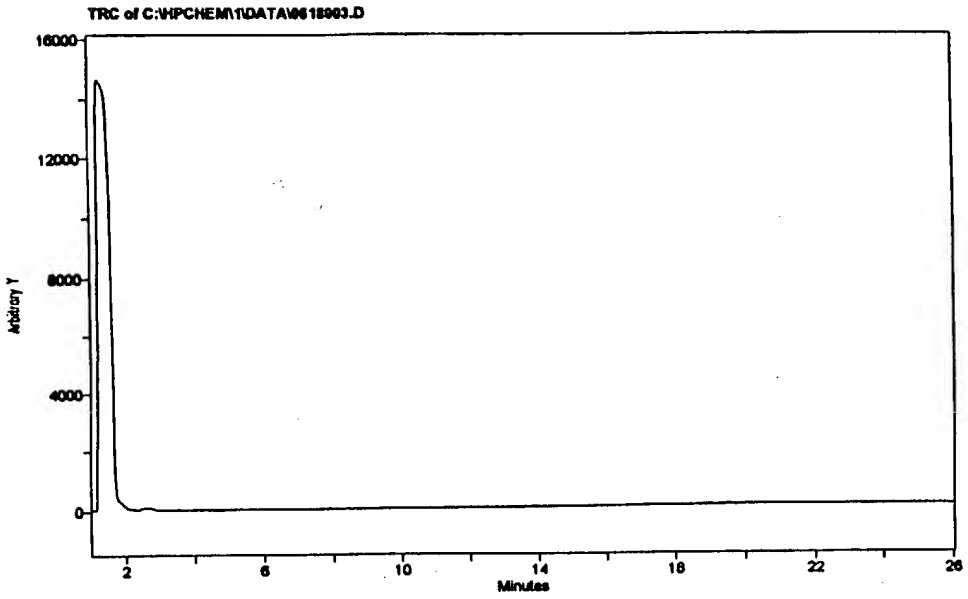


FIGURE 5: The IRD scan of the same spectrum of Figure 4 done by analysts Louis A. Dee and Norman Wade [1] showing that none of the MS peaks have an IR signature at their atomic weight. This complementary test proved that the attractive bond originating the new peaks cannot be of valence type since the cluster size prevents perfect spherical symmetry. Upon a number of repetitions of the tests, the analysts released a signed statement that the species was new. Note the detection of the IR signature of the CO_2 that, however, is a constituent of all the MS peaks, since the CO_2 is not identifiable as an isolated species in the MS scans. Other scans for different mass ranges reported in Ref. [1] have confirmed the additional presence in the peaks of Figure 4 of isolated H, C and O atoms, as well as of radicals O-H and C-H and ordinary molecules, thus confirming the definition of a magnecule reviewed in the tex.

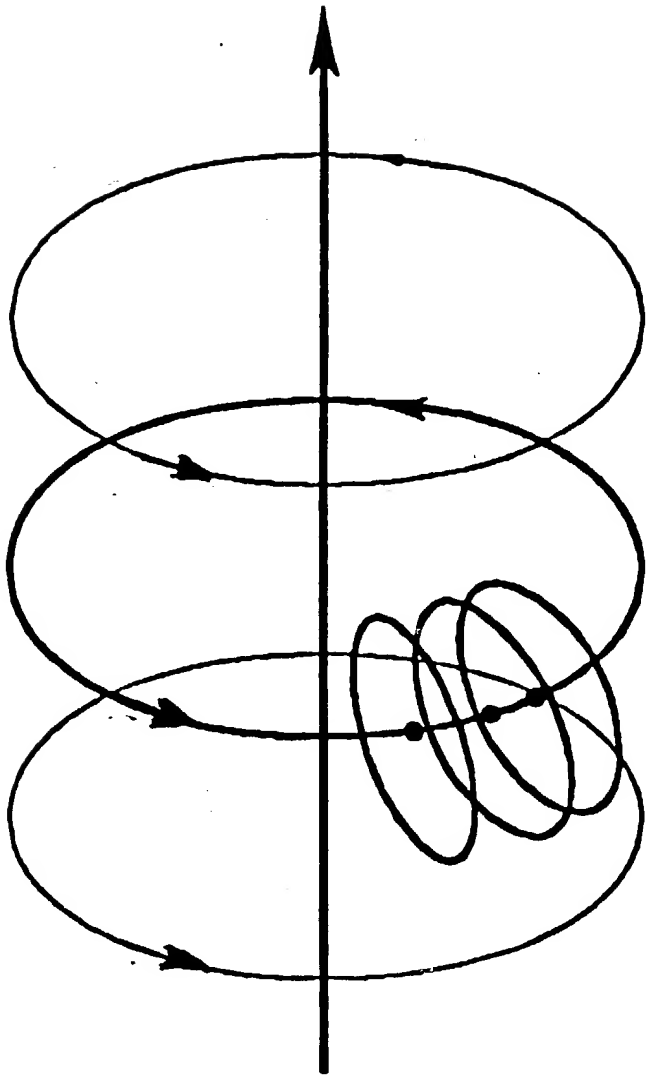


FIGURE 6: A schematic view of the creation of the new species of Santilli magnecules reproduced from Ref. [1]. A DC electric arc with about 3,000 A (represented with the vertical axis) creates a magnetic field (represented with circles perpendicular to the arc) that at atomic distances can reach values of up to 10^{11} Gauss, thus being suitable to polarize atomic orbitals into toroidal distributions (represented with circles perpendicular to the magnetic flux line). The electric arc also aligns polarized atoms one next to the other with opposite magnetic polarities North-South-North-South-etc., thus causing magnetic bonds. Individual toroidal polarizations are unstable. However, bonded polarizations of two or more atoms are stable at ambient pressure and temperature because rotations and oscillations occur for bonded polarized atoms as a whole.

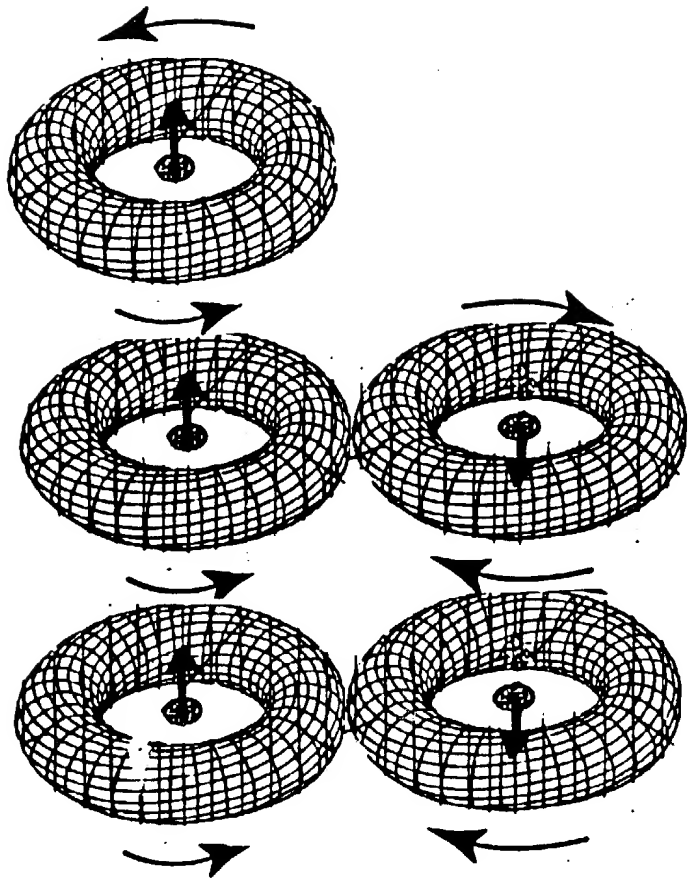


FIGURE 7: A schematic view from Ref,. [1] of a magnecule composed of one single polarized H atom bonded to another polarized atom of a C-H radical that, in turn, is magnetically bonded to one atom of an H_2 molecule. The structure has the same atomic weight of CH_4 and, therefore, it appears as methane under FTIR and other detectors resulting in an "experimental belief" due to the lack of an independent verification. The test of the same peak with the IRD reveals the lack of a valence bond at 16 a.m.u. Note that the total magnetic moment of the Hydrogen molecule is depicted in this figure as being null in conformity with its diamagnetic character (because consisting of two opposite magnetic polarities at a very short mutual distance), while admitting magnecular bonds at the level of the individual atom,s (see Ref. [1] for details on the model of the H_2 molecule having opposing magnetic polarizations).